State of Illinois
Energy Assurance Plan
Version 5.0

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Illinois Department of Commerce & Economic Opportunity
State Energy Office

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The Illinois Energy Assurance Plan was prepared by the Illinois Department of Commerce & Economic Opportunity (Department of Commerce). The document supports Illinois Public Act (20 ILCS 1105/) which authorizes the Department of Commerce to prepare energy contingency plans which shall include procedures for determining when a foreseeable danger exists of energy shortages and actions to be taken to minimize hardship to state citizens.

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Executive Summary

The State Energy Office within the Illinois Department of Commerce & Economic Opportunity is pleased to present this Energy Assurance Plan in cooperation with the Illinois Commerce Commission (ICC) and the Illinois Emergency Management Agency (IEMA). The purpose of the plan is to 1) catalog the State of Illinois' current and historical energy sources and uses; 2) identify potential disruptions to these sources via damage to infrastructure from man-made or natural disasters; 3) identify potential disruptions from unexpected price increases or loss of supply; 4) estimate the effect these disruptions would have on the state's citizens; 5) and delineate the ways in which the state can assist in the restoration of the energy supply. All communication with policy makers and government agencies will be through the Illinois Emergency Management Agency for disaster-related disruptions or the Illinois Department of Commerce's State Energy Office for supply shortage issues. All communication with the public will be through the Governor's Office.

This plan will summarize the past, current, and predicted future energy use in the State of Illinois and describe current programs and regulations in place to monitor energy and prepare for and recover from an energy emergency. It will identify and address potential shortcomings in the system and describe the means of overcoming these shortcomings.

The State of Illinois has a robust energy emergency recovery plan. IEMA's State Emergency Operations Center (SEOC) has been deemed one of the best in the country. The state's response to energy emergencies in the past has been efficient and rapid. This plan addresses the methods the state has put into place for long-term monitoring of energy supplies and responding to natural gas and petroleum shortages.

In addition, the plan addresses the roles and responsibilities of different state agencies, identifies when the state becomes involved in energy disruptions and restoration, describes appropriate communication within the state, between the state and others in the event of a disruption, and identifies available state assistance for energy restoration.

In the State of Illinois, the initial responsibility for responding to energy emergencies lies with local governments and private energy providers. When it is clear that local and private resources are insufficient for timely restoration of energy sources, the state may become involved. In order to determine when this is appropriate, the state has reviewed previous disruptions and their impact and provided a means for local government, law enforcement, and private energy providers to quickly contact the state to request assistance when appropriate. The Governor will decide when state assistance is appropriate. IEMA oversees disaster recovery. The Illinois Commerce Commission, in its liaison role with IEMA, monitors utility energy disruptions and facilitates communications between private entities and state agencies. The state agencies involved in energy assurance and disruption response were involved in the development of this

plan. This plan is intended to clearly define the lines of communication prior to, during and after an energy emergency.

Illinois obtains the majority of its energy from four sources: petroleum for transportation, natural gas for heating; and coal, natural gas and nuclear power for electricity. Most of the natural gas and petroleum is imported into the state, while Illinois is a net producer of electricity and leads the nation in electricity generated from nuclear facilities. The state is a hub for natural gas and petroleum pipelines and leads the Midwestern U.S. in refining capacity.

The infrastructure associated with energy in Illinois (pipelines, processing and refining facilities, generating facilities, and transmission lines) is vulnerable to natural and man-made threats. Past disruptions have been dominated by weather-related events, but catastrophic events such as acts of terrorism or a large-scale earthquake are potential threats to energy supplies. Any of a number of threats could lead to electrical blackouts, supply disruptions, or rising petroleum and energy prices. As a result, specific plans to prepare, monitor, and respond quickly to energy emergencies or shortages have been developed. These plans are included in this document.

The intent of this document is to identify risks and recovery plans that will help ensure the citizens of Illinois receive the most reliable and affordable energy available while encouraging conservation and a movement toward clean, renewable energy sources. The plan will be a living document with regular updates available on the internet for state citizens and other interested parties. It is noted here that suggestions and input from the public and any interested parties are welcome.

Introduction and Purpose

Introduction

The Illinois Energy Assurance Plan (IEAP) should serve as a guide for how the state will prepare for and respond to energy outages and/or shortages in the form of short-term sudden disruptions or long-term disruptions caused by shortages in supply or dramatic price increases. The IEAP will be updated and enhanced based on lessons learned from exercises and actual response and recovery operations. Periodic updates to the IEAP will include changes due to lessons learned, new technology, new methods of response, or additional capabilities.

Private energy providers and local governments in the State of Illinois have the capabilities and primary responsibility for response to and recovery from energy supply disruptions. When these capabilities are exceeded, state assistance is available. In addition, the state must prepare for longer energy disruptions caused by scarcity of raw materials, price increases, or alternative sources of energy by state energy providers and consumers. This plan is the guide for state preparedness, monitoring, response, and recovery operations; it outlines actions in support of local response to and recovery from hazards and state methods for monitoring energy supply, price, and infrastructure. The plan discusses state energy needs, potential disruptions to the energy supply, and the response mechanisms in place at the state level to restore energy if a disruption occurs.

Purpose

The purpose of the IEAP is to provide guidance to state agencies and Illinois citizens on how the state will prepare, monitor, respond to, and recover from disruptions in energy supply and delivery. It incorporates applicable provisions from the Illinois Emergency Operations Plan (IEOP).

The IEAP considers energy supply disruptions that will require a significant state presence. A "significant state presence" is defined as a situation that requires the assistance of state agencies in addition to those that routinely respond to day-to-day contingencies under separate authorities such as the State Police, local government authorities, or private sector energy providers. Those situations requiring only local government or private energy provider response are not addressed in the IEAP.

The IEAP contains assignments for state monitoring, response, and recovery activities related to energy supply disruptions. It, however, is not a regulatory document. It has been developed based on the compilation of various state documents and with the cooperation of state agencies. The plan describes the relationships among the state and federal agencies, local governments, and private energy providers, and among state agencies. The plan provides information on anticipated actions for state agencies that have energy supply monitoring and restoration

responsibilities. Finally, it provides information on the various state response mechanisms, capabilities, and resources available to local governments. It also addresses state agencies, personnel, and methods necessary to monitor long term energy supply and the energy infrastructure.

The plan addresses those emergency support activities necessary for a coordinated state response to a significant disruption in energy supply, regardless of cause. The level of response will be determined by the magnitude of the disruption. The Governor will make the final determination of the level of state response.

Section One. Overview of Energy Production, Use, and Disruptions

Summary description of state's energy use

Illinois is the fifth most populous state in the U.S and is fifth in energy consumption. Its central location and large population make it a large consumer and transporter of energy. The state used just under 4,000 trillion British thermal units (Btu) of total energy in 2012 (EIA), which is four percent of the US total. At the same time, the state produced 2,446 trillion Btu of energy, making it a net importer. Illinois is also ranked fourth in the country in industrial manufacturing but ranked 26th for per capita in energy use, indicating its industrial base may not be energy intensive.[1] The state has limited reserves of petroleum and natural gas and must import these from other states or countries. Illinois also has a large coal reserve (producing 33.7 million short tons in 2009), but much of the coal is currently not mined and is high in sulfur. The state imported 94% of the coal used for electrical generation (37.2 million tons) in 2008. It is, however, a net exporter of electricity with an active nuclear generation industry. Illinois has 11 operating reactors at six facilities and ranks first in the nation in nuclear electrical generation.

TABLE 1 indicates the energy sources and total Btu for Illinois in 2012. Twenty four percent of the total energy used in Illinois was from nuclear generated electricity versus the national average of 8.5%.[2] This could be a critical difference in Illinois' energy portfolio and needs to be taken into account when considering energy assurance and potential disruptions. Nuclear power plants are considered by many to be clean because they generate zero emissions of acid gases like sulfur dioxide, green-house gases like carbon dioxide, and other pollutants regulated by the Environmental Protection Agency. However, nuclear power remains controversial due, in part, to concerns over the long-term storage of nuclear waste and the specter of nuclear accidents such as those occurring in Chernobyl in 1986 and Fukushima in 2011. Within Illinois, there are six nuclear power stations housing a total of 11 nuclear generating units that are currently operational, licensed by the Nuclear Regulatory Commission to operate for another seven to 18 years. While those licenses can be renewed, the plants' primary owner, Exelon, has indicated that for economic reasons, it may retire up to three of the six nuclear power stations before their current licenses expire.

Table 1: 2012 Illinois Energy Use in Trillions of Btu (source: US DOE EIA).

State	Total Energy	Coal	Natural Gas	Petroleum	Nuclear	Renewable	Interstate Elec. Flow
Illinois	4,293	969	939	1,154	1,010	219	-446
%	100%	23%	22%	27%	24%	5%	-10%

[1] http://www.nam.org/Data-and-Reports/State-Manufacturing-Data/2014-State-Manufacturing-Data/2014-State-Manufacturing-Data-Table/

[2] http://www.eia.gov/state/?sid=IL#tabs-1

In 2012, only 5% of Illinois' energy came from renewable sources (such as wind, solar, hydro-electric, and biomass). Between 2007 and 2008, the state adopted renewable energy and energy efficiency standards requiring the state's electricity suppliers to source at least 25% of their retail electricity sales from renewables (by 2025) and to reduce retail consumption of electricity and natural gas by two percent (by 2015, incrementally, each year).

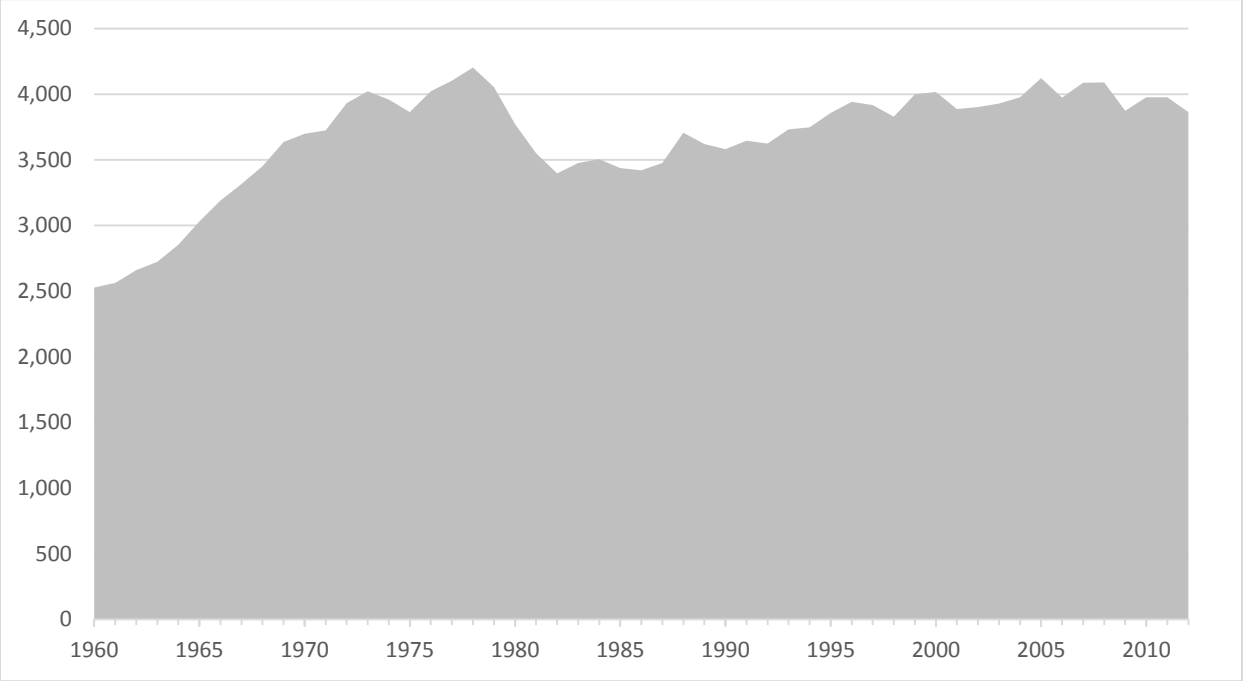
An overview of Illinois' energy strengths and weaknesses indicates the state is a major transportation, distribution, and oil refining location and produces a good deal of electricity, but also imports much of the raw materials for energy production (TABLE 2).

Table 2: Strengths And Weaknesses Of Illinois Energy Supplies.

Strengths	Weaknesses
Petroleum	
* Leads the Midwest in refining capacity	* Most of state's petroleum is imported, making the state more vulnerable to supply disruptions
* Numerous pipelines run through and terminate in state	* Any disruption in down-stream pipelines effects Illinois production
	*Not all of petroleum products produced in state are used here. Refineries do ship out of state
* Four in-state refineries	
* Oil comes from Canada and Gulf Coast to Illinois refineries	
Electricity	
* Top nuclear electricity producing state in US	* Top energy consuming state due to industry
* Third largest coal reserves in U.S.	* Most of state's coal is high in sulfur
* Leading producer and net exporter of electricity	* Strong reliance on coal and nuclear power (over 95%)
Natural Gas	
* Major transportation hub for natural gas	* Most natural gas used by state is imported
* Numerous pipelines run through and end in state	* Any disruption in down-stream pipelines impacts Illinois production
Renewable	
* Top producer of corn-based ethanol	* Little potential for hydro-electric
* Potential for wind and solar contributions	* Estimated renewable capacity will not meet state demand

A summary of Illinois' energy sources, infrastructure, supply, and demand shows an increased use of all energy sources since 1960 (Figure 1). The EIA expects total energy consumption in the U.S. to increase by 6.7% by 2022. A commensurate increase in Illinois would be expected. With aging nuclear facilities and increasing regulations on coal powered electrical generation the state will need to find new sources of electrical generation or reduce consumption.

Figure 1: Total Energy Consumption in Illinois from 1960 to 2012 (in trillions of Btu).



The state has developed energy fact sheets for the four major energy sources (electric, natural gas, petroleum and renewables) which it has placed on the internet to promote a better understanding of state energy supplies, production and consumption (Appendix 4).

State energy producers

Electricity

Four investor-owned public utilities provide electricity to consumers in Illinois. Of these, Ameren Illinois (Ameren) and Commonwealth Edison (ComEd) serve the vast majority of citizens. (Table 3 3). Each company has detailed plans for service restoration and communicates well and often with the ICC and IEMA during energy disruptions.

The state also has a number of municipal and cooperative electricity providers. There are 25 electrical cooperatives and three power generation and transmission cooperatives in the state. Sixty-four municipalities in Illinois also operate their own electrical utilities. Neither the municipal utilities nor the electrical cooperatives are required to report outages or work with the

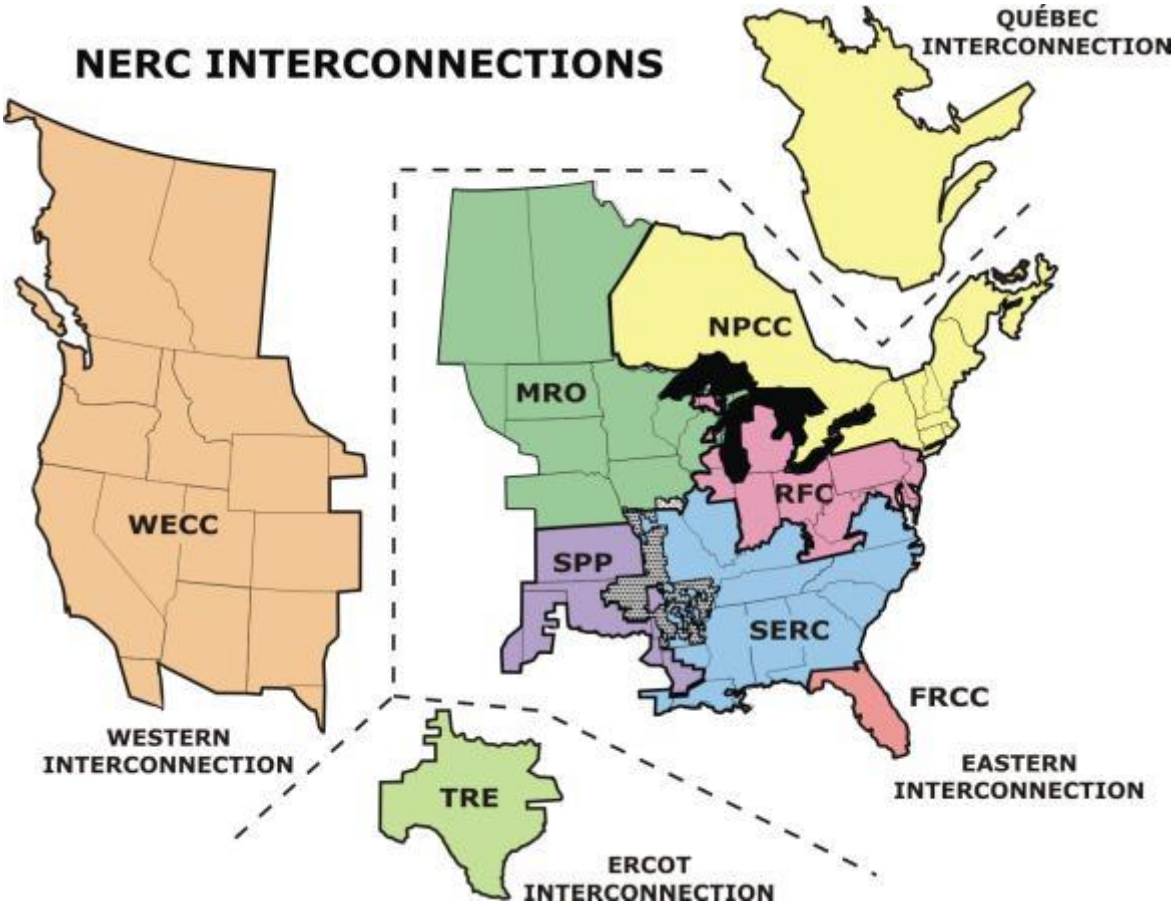
state in restoration efforts, but both groups have found it to their advantage to do so. These groups have created associations [the Illinois Municipal Utilities Association (IMUA) and the Association of Illinois Electric Cooperatives (AIEC)]. Each of these associations works with the ICC as needed to provide updates on service restoration. This works well in the case of large scale outages and allows the state to have a single point of contact for emergencies. Each of these associations also has its own emergency operation plans which they have developed with their members and have shared with the state. The municipalities in Illinois also have a mutual aid network, Illinois Public Works Mutual Aid Network.

Table 3: Electricity Providers and the Numbers of Their Customers in Illinois in 2014.

Utility Name	Location in Illinois	# of Customers
Ameren Illinois	Central and south	1,223,176
Commonwealth Edison Company	North	3,864,059
Mid-American Energy Company	Northwest	85,162
Mt. Carmel Public Utility Company	Southeast	5,345

Illinois is split between three of the eight North American Electric Reliability Corporation (NERC) regional entities: the Reliability First Corporation (RFC) and the SERC Reliability Corporation (SERC), and the Midwest Reliability Organization (MRO). Among Illinois electric distribution company owners, Ameren Illinois, the Southern Illinois Power Cooperative, and the City of Springfield (City Water Light and Power) are members of SERC; Exelon is a member of RFC, and MidAmerican Energy Company (MEC) is a member of MRO. Illinois is also split between two regional transmission organizations (RTOs) that plan and coordinate transmission assets and operate wholesale power markets: the Midcontinent Independent Transmission System Operator, Inc. (MISO) and the PJM Interconnection, L.L.C. (PJM). Among the largest transmission asset-owning utilities in the State, Ameren Illinois and MidAmerican Energy Company are members of MISO and ComEd is a member of PJM. Electric generating facilities are also split between numerous companies and governmental entities, with most of the generating capacity (over 60%) belonging to Dynegy, Exelon, and NRG.

Figure 2: North American Electric Reliability Zones which Represent Inter-Connected Electrical Infrastructure Regions.



There were 183 electricity generating plants in Illinois in 2010 according to the USEPA's eGrid website which were owned by over 100 different companies or municipalities, but many of these are small diesel or natural gas plants designed to serve a specific location or function as a backup.[3] Many smaller natural gas plants were also designed to serve as reserve for peak electricity use in the summer. The six nuclear plants produced 48% of the electricity for the state. The 20 plants with the greatest megawatt output (all coal or nuclear) generated almost 90% of Illinois' electricity (Table 4). These plants were owned by six companies, two of which are sister companies to Ameren and ComEd. Each large plant has its own EOP in place for disruptions with nuclear facilities having advanced plans and frequent exercises.

[3] http://epa.gov/cleanenergy/energy-resources/egrid/index.html#

Table 4: List of Top 20 Electrical Generating Plants in Illinois in 2013 by Nameplate Capacity.

Plant Name	Plant Primary Fuel	Nameplate Capacity (MW)	% of State Total	Cumulative % of Total	Plant owner name (first)
Braidwood Generation Station	Nuclear	2450 MW	5%	5%	Exelon Nuclear
Byron Generating Station	Nuclear	2450 MW	5%	10%	Exelon Nuclear
LaSalle Generating Station	Nuclear	2340 MW	5%	14%	Exelon Nuclear
Clinton Power Station	Nuclear	1138 MW	2%	16%	Exelon Nuclear
Dresden Generating Station	Nuclear	2019 MW	4%	20%	Exelon Nuclear
Quad Cities Generating Station	Nuclear	2019 MW	4%	24%	Exelon Nuclear
Powerton	Nuclear	1785 MW	4%	28%	Midwest Generations EME LLC
Prairie State Generating Station	Coal	1766 MW	3%	31%	Prairie State Generating Co LLC
Joliet 29	Coal	1320 MW	3%	34%	Midwest Generations EME LLC
Kincaid Generation LLC	Coal	1319 MW	3%	37%	Equipower Resources Corp
Baldwin Energy Complex	Coal	1894 MW	4%	40%	Dynegy Midwest Generation Inc
Newton	Coal	1235 MW	2%	43%	Illinois Power Generating Co
Coffeen	Coal	617 MW	1%	44%	Illinois Power Generating Co
Will County	Coal	598 MW	1%	45%	Midwest Generations EME LLC
Havana	Coal	488 MW	1%	46%	Dynegy Midwest Generation Inc
Duck Creek	Coal	441 MW	1%	47%	Illinois Power Resources Generating LLC
Coffeen	Coal	389 MW	1%	48%	Illinois Power Generating Co
Wood River	Coal	388 MW	1%	48%	Dynegy Midwest Generation Inc
E D Edwards	Coal	364 MW	1%	49%	Illinois Power Resources Generating LLC
Joliet 9	Coal	360 MW	1%	50%	Midwest Generations EME LLC

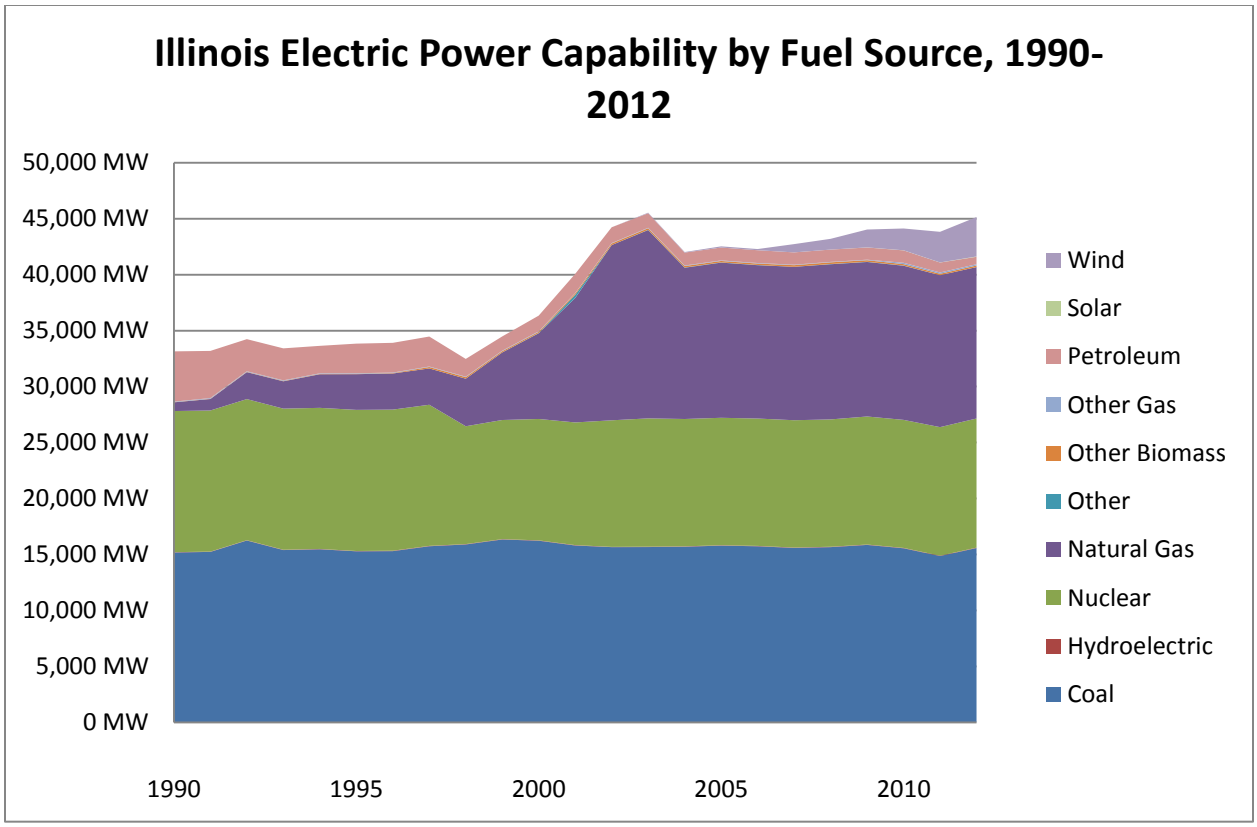


Figure 3: Illinois Electric Power by Fuel Source

Petroleum

Illinois is a major delivery and transportation hub for raw crude oil with four refineries in the state and another just across the border in Indiana (Table 5). Several pipeline companies deliver crude oil to these refineries. The ICC lists 29 pipeline companies certified in Illinois. These include each of the companies that own a refinery plus Enbridge, which provides an ever-increasing amount of Canadian crude, and a few other smaller companies. Each refinery has extensive plans for emergencies and disruptions. The refineries and pipeline companies are not required to share their EOPs with the state, but have participated in state exercises and shared their reactions to scenarios with the state.

Table 5: List of Illinois Refineries and Their Capacities, 2012.

Company	Nearest City	Barrels per Day
PDV Midwest Refining LLC	Lemont	167,000
ExxonMobil	Joliet	238,000
Marathon	Robinson	206,000
WRB Refining LP (Phillips 66)	Wood River	306,000
BP	Whiting, IN	405,000

Oil, originating as raw crude, is refined into petroleum products (gasoline, propane, diesel etc) at the refineries; and additional pipelines transport the products to wholesalers, retailers and value-adders. Gasoline is transported to the 25 terminals in Illinois where it is mixed with additives for each gasoline station and transported via semi-trailer to the stations that are primarily independently owned.

Through propane only heats approximately five percent of Illinois homes, price swings in the propane market can have devastating effects on these consumers.

Natural Gas

Nine separate companies are certified to offer natural gas to consumers in Illinois while 64 municipalities operate their own natural gas utilities, along with 17 companies that are listed as alternative gas providers (Table 6). Along with electricity, Ameren is responsible for natural gas distribution and delivery in much of the MISO region of Illinois.

Table 6: Utilities Certified to Sell Retail Natural Gas in Illinois.

Utility Name	Location in Illinois	# of Customers
Ameren Illinois	Central and south	810,059
Liberty Utilities	South	21,772
Consumers Gas Company	South	5,394
Illinois Gas Company	South	9,571
Mt. Carmel Public Utility Company	South	3,481
Nicor Gas Company	North	1,912,341
North Shore Gas Company	North	146,148
Peoples Gas Light and Coke Company	North	765,384
MidAmerican Energy Company	North	65,274

Several companies own natural gas pipelines which operate in Illinois. These pipelines must follow the same guidelines as petroleum pipelines with the federal government's National Transportation Safety Board (NTSB) for interstate lines and ICC for intrastate. All companies offering natural gas in Illinois have EOPs. Nicor, which serves the largest number of customers in Illinois, has EOPs for several scenarios. Nicor and Ameren are active in emergency training exercises. All companies with natural gas pipelines and facilities in Illinois must file a safety plan with the ICC.

Historical disruptions

The largest disruption to the state's energy supply has been to electricity caused by weather, specifically thunderstorms, tornadoes, heavy winds, and ice storms. The State of Illinois Emergency Operations Plan (IEOP) lists the 15 primary hazards for the state broken into three categories. The risk is based on historical events and potential threat (natural, technological, and human-caused) (Table 7).

Table 7: A List of the Highest Risk Hazards for the State of Illinois.

Hazard		
Natural	**Technological**	**Human-Caused**
1) Severe weather	8) Haz-Mat - chemical	11) Terrorist act
2) Tornado	9) Haz-Mat - radiological	12) Civil disobedience
3) Flood	10) Dam failure	13) Cyber attack
4) Drought		14) Agricultural epidemic
5) Extreme heat		15) Public health epidemic
6) Severe winter storm		
7) Earthquake		

IEMA has released a State of Illinois Natural Hazard Mitigation Plan (INHMP) that identifies potential natural hazards and vulnerabilities for the state, as well as strategies for mitigating the effects. This plan is comprehensive and lists severe thunderstorms and tornadoes, floods, severe winter storms, drought, extreme heat, and earthquakes as the natural hazards for which the state is at greatest risk. As a component of the plan, previous federal disaster declarations were summarized for the years dating back to 1957. All of these will affect the electrical infrastructure and transportation of fuel. Extreme heat could tax the electrical system while threatening to reduce output from nuclear facilities which may have to reduce output to ensure cooling ponds do not overheat. Flooding and earthquakes could affect the natural gas and petroleum pipeline distribution network as well as the electrical infrastructure and transportation network. During the 2009 severe storm outbreak in southern Illinois, damage to natural gas pipelines from uprooted trees was significant. Severe storms and tornadoes may also damage renewable resources such as windmills and

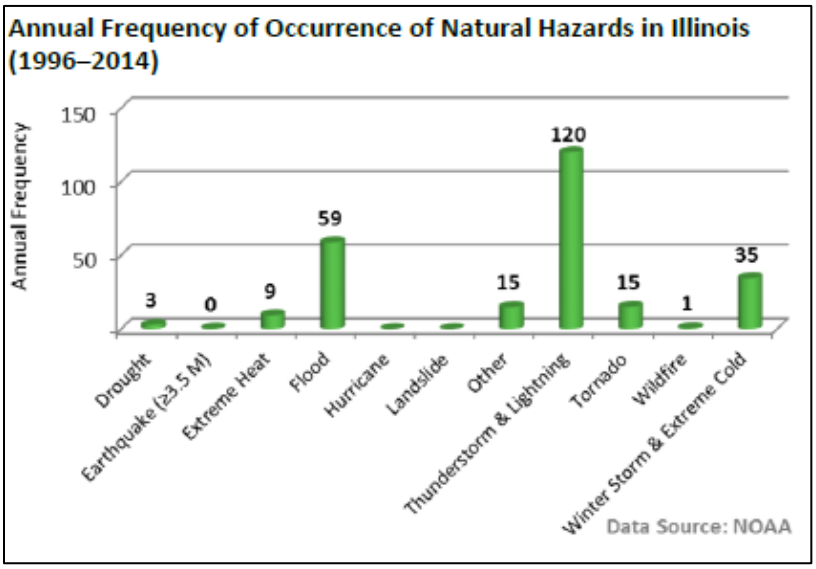


Figure 4: Frequency of Natural Hazards in Illinois.

solar arrays.

In addition to identifying historical disasters, the INHMP identifies the potential risk for future disasters in each Illinois county along with the potential severity of that disaster based on historical events. Potential risks based on historical events are listed in Table 8. The northern half of the state was listed as having high potential for severe damage from storms. Those counties along the Mississippi River and Cook County were listed as severe risks for floods.

Table 8: Risk levels for potential hazards based on past events (from INHMP).

Risk Level	Number of Historic Events
Low	0-12 (green)
Guarded	13 to 24 (blue)
Elevated	25 to 36 (yellow)
High	37 to 48 (orange)
Severe	49 to 60 (red)

IEMA has also released a State of Illinois Human-Caused Hazards Mitigation Plan (IHCHMP) which includes the Illinois Technological Hazards Mitigation Plan (ITHMP). The plan addresses a variety of human and technological hazards. Those of greatest concern to energy assurance are 1) terrorist acts and dam failure with their effect on infrastructure; 2) public epidemic with its impact on workforce; 3) and cyber threats with their potential damaging effect on the SCADA systems which run electrical components for pipelines, refineries, electrical generating plants, electrical transmitters etc., especially as the use of smart grids for electricity which rely on software, becomes more prevalent.

The IHCHMP lists the threat of terrorism as high in all counties in Illinois. The risk of all other human-induced and technological hazards is elevated in most counties, but high in the counties around Chicago and severe in Cook County (Chicago). The risk of all human-caused and technological threats is listed as severe in Cook County because of the dense infrastructure and population in Chicago.

Section Two. Energy Emergencies and Response

Legal Authority

Emergency Response

Authority for emergency response in the state of Illinois is enacted in the Illinois Emergency Management Agency Act (20 ILCS 3305/6(2)b,c and 7 (11)). This act authorizes the Governor to 1) create the Illinois Emergency Management Agency (IEMA) and emergency management programs within appropriate state political subdivisions, 2) appoint the director of IEMA, 3) have general direction and control of IEMA, 4) provide for the rendering of mutual aid in the case of a disaster, 5) provide funds for disaster recovery, 6) declare a disaster which gives the governor emergency powers including:

- Suspend any regulations which could delay disaster response
- Access and utilize all available state resources toward disaster recovery
- Transfer duties of state agencies and personnel toward disaster recovery
- Acquire personal property or property to be used in disaster recovery (with compensation). This is relevant to energy assurance as gasoline, generators and other energy supplies or generating equipment can be accessed
- Recommend evacuation
- Control routes to and from disasters and access to disaster sites
- Control sales of alcoholic beverages, firearms and combustibles.
- Make provisions for emergency housing
- Control, restrict and regulate the sale of food, fuel and other commodity items. *This is obviously relevant to energy assurance also as the Governor can use quotas and fix the price of transportation fuels and other energy-related items.)*
- Governor is commander and chief of all state militia.
- Prohibit increases in the prices of goods and services. *This too is relevant to energy assurance as the Governor can ensure fuel prices remain stable during a disaster.*

The act defines a disaster as "an occurrence or threat of widespread or severe damage, injury or loss of life or property resulting from any natural or technological cause including…critical shortages of essential fuels and energy…". What constitutes "critical shortages of essential fuels and energy" will be interpreted by the Governor and his office, but it is hoped information in this plan and generated by the supply disruption tracking plan will assist in this decision.

Also within the act are well defined guidelines for IEMA and local and regional emergency management entities. A requirement of the act is the development of the Illinois Emergency Operations Plan (IEOP) which defines state agency responsibilities in response to a disaster. The requirement for IEMA to exercise the plan is also in the act.

The Disaster Relief Act (15 ILCS 30/0.01) defines how the Governor appropriates funds during a disaster and works with the federal government, if appropriate, to obtain federal disaster relief.

The state does have weight limitations for vehicles under Illinois Compiled Statutes 625 ILCS 5 Illinois Vehicle Code Section 15-111 but these load limits are waived for utility vehicles "when operated by a public utility when transporting equipment required for emergency repair of public utility facilities…". Section 15-301 does give the Illinois Department of Transportation (IDOT) the authority to issue permits allowing vehicles to be above the weight limit. IDOT does issue these permits in situations in which heavy equipment is required for disasters.

The Illinois Vehicle Code also covers the maximum number of hours a driver may operate a vehicle (per day (15 hours) per 7 day period (70 hours)) under section 18b-106.1. These are above the requirements of the Federal Motor Carrier Safety Administration (FMSCA) for interstate transport. IDOT can also offer waivers for driver hour overages during an emergency, and the Governor can also waive the state limitations in times of emergency.

Electric and Natural Gas Utilities

The Illinois Public Utilities Act ((220 ILCS 5) is the primary source of regulation for utilities in the state. The act was written to try to ensure state citizens received reliable, affordable electricity and natural gas. The act created the Illinois Commerce Commission (ICC). The commission has supervision over the state's public utilities, reviewing the utilities' general condition, rates, reliability, customer assistance, etc. The law requires each utility to develop a security program based on North American Electric Reliability Council (NERC) security standards that's to be annually tested

220 ILCS 15 Gas Storage Act, 220 ILCS 20 Illinois Gas Pipeline Safety Act and 220 ILCS 25 Gas Transmission Facilities Act are the primary regulations regarding the storage and transportation of natural gas in Illinois. The gas storage act deals mainly with the safe, cost-effective storage of natural gas and the rights of the natural gas companies to purchase and alter property for that use. The pipeline safety act gives authority to ICC to develop safety guidelines for intrastate pipelines, requires gas companies provide plans to the ICC on their safety guidelines for pipeline facilities and the pipelines themselves, and gives the ICC the authority to convene court hearings if they find a plan is inadequate. The act requires pipeline companies to report all accidents associated with pipelines and facilities to the ICC and gives the commission the right to request civil penalties if safety guidelines are not followed. The act also states that the Public Utilities Act applies to pipelines and facilities.

Petroleum

Illinois does not directly regulate the petroleum industry, and therefore, the regulations regarding this industry are more limited. However, various laws are in place to protect public safety including Titles XVI - Petroleum Underground Storage Tanks and VI-C - Oil Spill Response

under the 415 ILCS 5 Environmental Protection Act which require anyone owning facilities, a tank or a pipeline which results in a leak to report the leak to the Illinois Environmental Protection Agency (IEPA), thereby ensuring the state will be notified if a large leak which, beyond the risk to life and the environment, could impact supply, should occur.

The Pipeline and Hazardous Materials Safety Administration (PHMSA), in coordination with the Federal Railroad Administration (FRA), recently adopted requirements designed to reduce the consequences and, in some instances, reduce the probability of accidents involving trains transporting large quantities of flammable liquids. The Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains rule defines certain trains transporting large volumes of flammable liquids as "high-hazard flammable trains" (HHFT) and regulates their operation in terms of speed restrictions, braking systems, and routing.

Illinois does have an alternative fuels act (Illinois Alternate Fuels Act. - 415 ILCS 120) which requires the IEPA to promote the use of alternative fuels for transportation (ethanol, bio-diesel, electric vehicles, ride sharing) including funding to support these efforts from fees from commercial vehicle users.

Energy Assurance

Illinois Public Act (20 ILCS 1105/) Energy Conservation and Coal Development Act provides language for the Illinois Department of Commerce to develop "energy contingency plans" which shall include "procedures for determining when a foreseeable danger exists of energy shortages...and…actions to be taken to minimize hardship". The energy assurance plan has taken on this role for the state.

State agencies and their roles

The Illinois Emergency Management Agency (IEMA) coordinates the state's overall emergency management program by working with local governments, state agencies, political subdivisions of the state, private organizations, and the federal government. IEMA coordinates when appropriate, with the Federal Emergency Management Agency (FEMA) and other federal agencies to provide disaster assistance following major disasters. IEMA provides emergency response operations related to communications, notification, incident command, and emergency response support to local governments. IEMA has divided the state into 11 regions (Figure 5: Illinois Emergency Management Agency Regions. Each region has a coordinator who responds to local government and private sector requests for assistance during an energy emergency. The regional coordinators reach out to the state IEMA office when the resources required for the response are beyond those the region or local governments can provide.

Figure 5: Illinois Emergency Management Agency Regions.

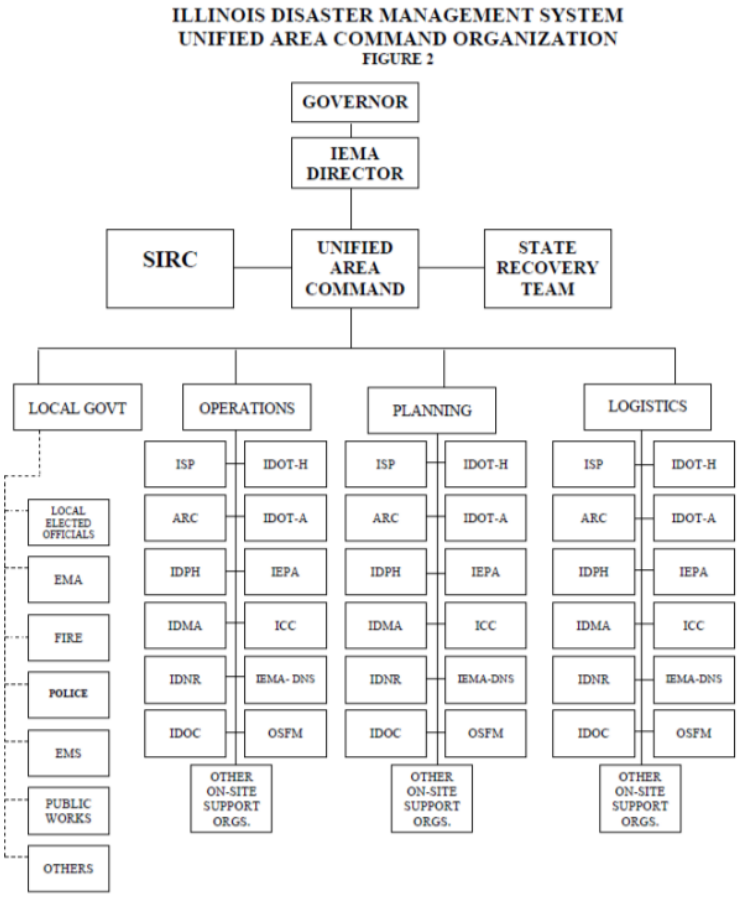

Jo Daviess
Stephenson
Winnebago
Boone
McHenry
Lake
Carroll
Ogle
DeKalb
Kane
4
DuPage
Cook
Whiteside
2
Lee
Kendall
3
LaSalle
Will
Rock Island
Henry
Bureau
Grundy
Mercer
Putnam
Kankakee
Stark
Marshall
Knox
Livingston
Warren
Peoria
Woodford
Irquois
Henderson
Hancock
McDonough
Fulton
Tazewell
McLean
Ford
Mason
7
Champaign
Vermillion
Schuyler
Logan
DeWitt
Adams
Menard
Piatt
Brown
Cass
Macon
Morgan
Sangamon
Douglas
Edgar
Pike
Scott
6
Moultrie
Christian
Coles
Greene
Macoupin
Montgomery
Shelby
Cumberland
Clark
Calhoun
Jersey
Fayette
Effingham
Jasper
Crawford
Madison
Bond
9
Clay
Richland
Lawrence
Marion
8
Clinton
St. Clair
Wayne
Edwards
Wabash
Monroe
Washington
Jefferson
Randolph
Perry
Hamilton
White
Franklin
Jackson
Williamson
Saline
Gallatin
11
Union
Johnson
Pope
Hardin
Alexander
Pulaski
Massac

Coordination of response

Emergency communication procedures

The Governor's Office determines the level of state response to any human-caused or natural disaster affecting the people of the State of Illinois. The IEMA Director, reporting to the Governor, manages and coordinates state operation, in accordance with the National Incident Management System (NIMS). The personnel, facilities, and equipment for responding to a disaster will be located in the State Incident Response Center (SIRC- a component of the State Emergency Operations Center (SEOC)). The IEMA Director is responsible for activating the SIRC. Guidelines for emergency response and recovery operations are described in detail in the Illinois Emergency Operations Plan (IEOP) which includes the Illinois Disaster Management System (IDMS) (Figure 6). Guidelines specific to energy sector emergency response can be found in "Emergency Support Function (ESF) 12 – Energy" of the IEOP. The ICC is listed as the primary agency responsible for energy sector restoration after a disruption in the ESF-12.

Figure 6: Illinois disaster management system unified area command organization (from the Illinois Emergency operations plan).



The SEOC is located in Springfield, Illinois and consists of a large operations facility with state-of-the-art equipment (computers, communications, etc.) in which representatives from state, private, and federal entities report and coordinate recovery efforts. IEMA activates the SEOC in state emergency situations. Within the SEOC is the State Incident Response Center (SIRC), the room where various government agency personnel gather, communicate, and monitor emergency response efforts during SEOC activation. Also within the SEOC are the Radiological Emergency Assessment Center (REAC), the State Terrorism and Intelligence Center (STIC), and the Communications Center. Only certain partners within the SEOC may be activated if an emergency only affects these segments. An IEMA spokesperson for public relations (Public Information Officer (PIO)) also reports to the SEOC when a disaster is declared and has support staff to handle communications with the public and policy makers. The following are communication procedures outlined in the IEOP for initiating the Unified Area Command (UAC) for field operations, the SIRC, and the SEOC once the Governor has approved state involvement in an energy disruption recovery effort.

- The State UAC will coordinate field (operational/tactical) response activities.
- A UAC may be established for any level of emergency requiring a state field presence; however, the location, activities, and scope will vary according to the parameters of the occurrence.
- IEMA will activate the SEOC. Agencies will send representatives to the SEOC as requested.
- IEMA will provide mission assignments and tasks.
- State Agency Duty Officers/SIRC Liaisons will be notified in accordance with IEMA Communications Center procedures. Agencies are responsible for internal notification of personnel.
- Each activated Emergency Support Function Annex (energy is Annex 12) will send representatives to the SIRC and/or UAC, as appropriate, to coordinate state response to the disaster or emergency. The SEOC representative from ICC will be notified for energy sector concerns. If it is not warranted, the energy annex will not be activated and ICC will not be contacted.
- Agencies will execute mission assignments and provide technical assistance as required. State agencies will provide personnel for the SEOC, UAC, and other response and recovery duties when requested.
- IEMA will notify all Primary Agencies of the existence of or potential for a disaster.

Affected local governments are responsible for identifying and communicating response priorities and state resource requirements to the SIRC or through the UAC if it is activated. Through these plans, local governments shall access and utilize all available resources to protect against and cope with an energy disruption. When local governments determine that available resources are not adequate to respond to an energy disruption, they may request assistance from

the state through the IEMA 24 hour-a-day emergency communication center in Springfield. Requests may also come through the IEMA Regional Coordinators. Local governments will have most likely communicated with and requested assistance from private energy providers prior to contacting the state. Energy sector entities such as utilities also may contact the ICC's IEMA liaison if the disruption appears significant, crosses multiple local jurisdictions, and will most likely require immediate state assistance.

The IEMA Director or designee(s) also maintains a constant liaison with the federal government, state agencies, disaster relief organizations, and other states' disaster agencies. A FEMA Operational Liaison(s) in the SIRC will provide the principal means of coordination between the SIRC and FEMA Region V.

Mutual Aid Networks

The Emergency Management Assistance Compact (EMAC) was established in 1996. EMAC is a national disaster relief compact which allows states to provide or receive mutual aid if requested by or from another state and establishes procedures for reciprocity, reimbursement, workers' compensation, and other considerations.

Within the state, Illinois has formed the Mutual Aid Response Network (MARN), which allows critical components of government to unite with the private sector for the deployment of a clearinghouse of resources needed during emergency response and recovery. MARN is designed to act as a force multiplier between the private sector and law enforcement/public safety to mitigate the impact of critical incidents, including natural disasters and acts of terrorism. The clearinghouses contain resources available from the private sector through Memorandums of Understanding and include reimbursement and terms of use for equipment. The MARN and private utilities often provide equipment, such as transformers, to each other as needed during an emergency. The government will bring to bear those resources such as state responders, police powers, and certain types of sensitive information to strike a balance of equal yet contrasting roles in this partnership. The MARN program emphasizes proactive preparedness, safety, and security through this clearinghouse of existing resources for statewide response. The MARN has a seat at the SIRC.

The state also has three other mutual aid networks which can be called upon in an energy emergency to assist in restoration efforts. These include the Mutual Aid Box Alarm System – Illinois (MABAS-IL) which provides firefighters and equipment to areas in need from a disaster or to fill in gaps left by firefighters leaving their municipality to support disaster response; Illinois Law Enforcement Alarm System (ILEAS) which is the police equivalent to MABAS-IL; and the Illinois Public Works Mutual Aid Network (IPWMAN) which is a mutual aid network of municipal public works including utilities that share equipment and personnel in times of disaster. Municipalities can contact any of these three organizations for support in restoration efforts.

In October 2011, IEMA launched a public-private initiative that will strengthen coordination between the state and the private sector during disasters. The Business Emergency Operations Center (BEOC) will enhance communication between the private sector and state emergency management personnel to improve preparedness, response and recovery efforts for major disasters.

The BEOC is an emerging concept in public-private working alliances across the nation as states recognize the integral role that private sector entities play in homeland security and emergency management. The BEOC provides an opportunity to strengthen community resilience and overall preparedness through an integrated emergency operations center approach.

The purpose of the BEOC is not to obtain goods and services, but to harness information available through the private sector and coordinate it with response and recovery actions developed in the SIRC. This collaborative effort among sectors will also improve pre-event planning and preparedness, which ultimately improves response and recovery. Sectors currently represented in the BEOC include: agriculture and food; retail; energy; information technology; postal and shipping; bank and finance; communications; transportation systems; chemical; manufacturing; healthcare and public health; water; security; small business; facilities; and service industry.

The BEOC was activated for the first time during the state's earthquake exercise in November 2011. The scenario of this three-day functional exercise was a 7.7 earthquake in southern Illinois along the New Madrid fault line. The BEOC was staffed by more than 50 private industry representatives, with virtual participation from companies that chose to operate from their in-house crisis management centers.

Response and coordination within and between state agencies

State disaster response operations in the SIRC and in the field are conducted in accordance with the National Incident Management System (NIMS). The IEMA Director is responsible for the overall coordination of response and recovery programs through the implementation of the IEOP as directed by the Governor. The IEMA Director or designee(s) also maintains a constant liaison with the federal government, state agencies, disaster relief organizations, and other states' disaster agencies. The ICC's liaison is responsible for facilitating communications between IEMA, other state agencies and private energy providers. All requests for resources or restoration to the ICC's liaison from other government agencies are coordinated through IEMA.

IEMA personnel coordinate the collection of disaster intelligence from state agencies, through the SIRC and UAC. The SIRC is the strategic coordination and management facility for all state response activities for a given emergency. State agency support will be coordinated via the emergency support function annex structure in accordance with the IDMS and NIMS. Implementation of portions of the SEOC and execution of initial actions could occur prior to a

Gubernatorial Proclamation of a disaster. State agency Duty Officers and SIRC Liaisons will be notified in accordance with IEMA Communications Center SOPs.

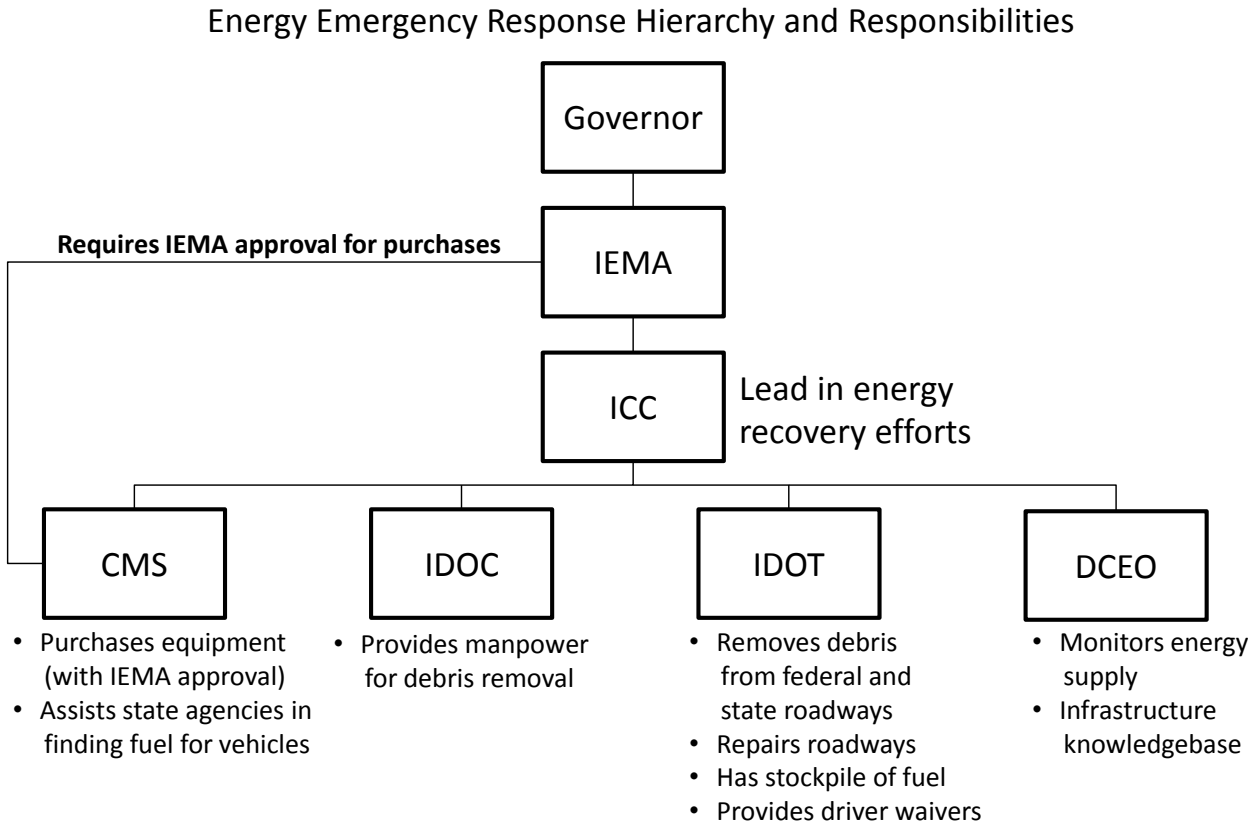
During energy disruptions, the state only steps in when the extent of the restoration is beyond the capacity of local municipalities and private sector emergency response efforts. The IEOP identifies the state agencies responsible for and actions required for the response to energy disruptions from disasters under the guidance of the Illinois Emergency Management Agency Act (20 ILCS 3305(6)(2)b, c and 7 (11)). The ICC has been identified in the IEOP as the agency responsible for facilitating communications between utility service providers and IEMA during an emergency. The ICC typically works closely with public utilities, municipal utilities, and electrical cooperatives to monitor service restoration, coordinating with other state agencies and ensuring the private sector has everything the state can provide to assist in restoration efforts. For long term monitoring of energy supply, the State Energy Office (SEO) within the Department of Commerce monitors the prices, available supplies, and forecasts for the raw materials the state uses.

While the ICC is the primary state entity responsible for facilitating communications between utilities and IEMA during an emergency, the Illinois Department of Commerce, the Illinois Department of Transportation (IDOT), Illinois Department of Central Management Services (CMS) and the Illinois Department of Corrections (IDOC), among other entities, may also be involved. The Illinois Department of Commerce monitors supplies and pricing, IDOT provides the equipment for removal of debris and road repair, CMS supports IEMA in the procurement of equipment and supplies (including transportation fuels), and IDOC provides manpower for debris removal. Long-term recovery is coordinated with state and federal agencies in accordance with their statutory authorities or, if significant enough, through special task forces established by state and federal officials.

IEMA supervises all emergency response efforts for the State of Illinois according to the IEOP. A section of the IEOP is devoted to the restoration of energy supplies and infrastructure after an emergency. The Energy Section of the IEOP was added as emergency support function number 12 (ESF-12). According to ESF-12, the ICC is the primary state agency responsible for energy restoration after an emergency, along with the Illinois Department of Transportation (IDOT), the Illinois Department of Central Management Services (CMS), the Illinois Department of Corrections (IDOC) and the Illinois Department of Commerce. IDOT provides the equipment for cleanup and energy restoration and driver hour and maximum weight waivers for utilities requiring personnel to work beyond typical shifts or to carry heavy loads to disaster sites. CMS provides IEMA assistance in procuring supplies and equipment for cleanup and restoration missions, IDOT clears roadways, and IDOC provides the labor required for cleanup after a disaster with their secondary roles and responsibilities (Figure 7). As of the writing of this version of the EAP, efforts are underway to include the Department of Commerce with the secondary role of energy supply and infrastructure tracking and situational awareness. In order

for this to be approved and included as an official role for the Department of Commerce, it must be approved as an official component of the IEOP and ESF-12. The state is currently pursuing the necessary steps for this to occur. In the meantime, a seat within the SIRC has been provided for the Department of Commerce's Energy Assurance Engineer (EAE).

Figure 7: Energy Emergency Response Hierarchy and Responsibilities.



CMS establishes master contracts with the private sector for critical equipment and goods such as generators and fuel. These contracts are established before the disaster and allow the state to access these items quickly during an emergency. They also are typically priced below retail since the state makes an effort to obtain volume purchasing. Municipalities can also have access to these items through joint purchasing contracts established by the state. Any purchasing CMS performs in support of energy restoration must be approved through IEMA by that agency's Finance Officer. CMS has signed contracts with gasoline terminals and gasoline and diesel transportation trucks. In an emergency, CMS can contact these groups and request trucks to transport fuel from these terminals to disaster affected areas to provide fuel for state, local, and private sector disaster responders.

According to the IEOP, the utilities will have first responsibility when restoring electrical and natural gas disruptions. The plan stipulates that the ICC will coordinate with state agencies to monitor energy restorations. The ICC, according to the plan, will coordinate damage assessments. The plan notes that the ICC does not have direct authority over municipal utilities and electrical cooperatives but is still expected to monitor their recovery efforts. In past emergencies, the associations for each (IMUA and IECA) have provided information to the ICC regarding individual municipal and cooperative systems affected by disruptions.

The Illinois SEOC holds monthly meetings during which the ICC liaison addresses any concerns regarding energy assurance. Other state agencies discuss any situations or concerns they may have. CMS, IDOT, the Department of Commerce and IDOC have representatives at the table, and the National Weather Service typically gives forecasts for potential weather concerns, reviews weather events from the previous month, and describes responses to those events. IEMA supervises the meeting and also reviews any points of concern, such as impending exercises and situations in the next month that may or will require activation of the SEOC (such as large public events).

Consequences and severities of energy emergencies and rate of recovery

The Department of Commerce's EAE will track the severities and consequences of energy emergencies by reviewing previous emergencies and documenting new emergencies as they occur. A critical question is "At what point does the state become involved?" Local municipalities and utilities can usually recover from smaller emergencies without requiring state assistance. A survey of previous emergencies that required state involvement shows when and at what level the state typically becomes involved; this serves as a guide for future emergencies. A component of the tracking sheet is the rate of recovery for each disruption. The ICC requires utilities to keep extensive records of reliability and post annual self-assessments, as well as provide their own assessments. These reports also address plans the utilities have to improve service. The OE-417 is a document required by the DOE to be filled out when an electrical outage affects a certain number of consumers. Results from OE-417 reports for Illinois utilities have also been logged by the State Energy Office (SEO) for the past ten years. The SEOtate Energy Office has also reviewed historic events where prices and/or supply of raw materials used to produce energy have been at critical levels to try to determine cause and better assist with monitoring for future events.

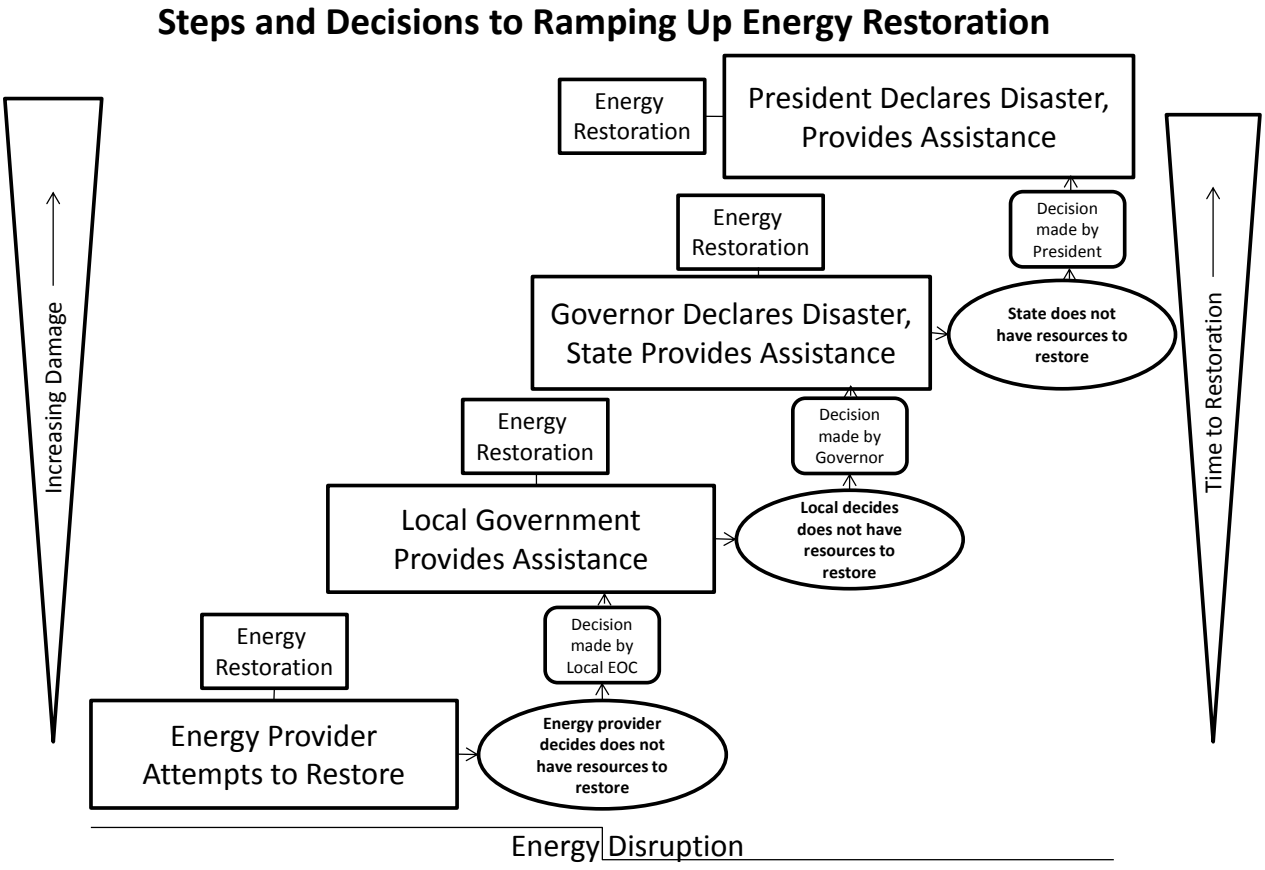
Role of ICC's Liaison to IEMA

Within ICC, the liaison to IEMA works within the SEOC to facilitate communications between the State and the private sector (utilities, pipeline companies, etc.). The ICC liaison role typically focuses on entities providing electric, natural gas, telecommunications and water service to end consumers, and does not include attention to other energy disruptions such as gasoline, propane and diesel. The ICC liaison reports the status of outages and restoration activities. IEMA is responsible for coordinating resources necessary to assist in recovery efforts.

Management decision process

Utility service providers are responsible for addressing service interruptions and restoring service. Depending on the severity of the interruption, the utility may be required to notify the ICC. In all instances, the utility may decide to notify the ICC whether or not required by law. The ICC and the utility may determine that State resources are required. If so, the ICC will make the necessary communications to IEMA and other agencies as needed.

Figure 8: Steps in Decision to Involve State in Restoration of Energy Disruption.



In the case of long-term supply disruptions, the Department of Commerce SEO will use the guidelines established in the supply disruption tracking plan (Appendix 1) to monitor energy pricing and supply for potential cost spikes or supply shortages. If there appears to be an impending issue, the EAE will contact IEMA. If the situation requires state intervention, the three agencies (Department of Commerce, ICC and IEMA) will work with the Governor's Office to make the appropriate state actions to correct the situation (conservation, price freezing, curtailment, alternative sources, etc.).

Responsibility for the identification and assessment of disruptions

For the purpose of this document the state will separate energy disruptions into two categories: emergency disruptions caused by a disaster in which normally functioning infrastructure is rendered ineffective and energy can no longer be distributed to consumers; and long-term supply disruptions in which the price or availability of raw materials for energy has become an issue for normal, affordable delivery.

Typically, in the situation of emergency energy disruptions, the energy providers and local officials will identify the problem and report to local emergency responders and IEMA. If the disruption involves electricity or natural gas supply to end-users, the ICC liaison will confirm the extent of the emergency with the private sector. Local governments have primary responsibility for response and recovery. The state will only become involved if the situation requires resources beyond those the local government and private sector can provide. IEMA and the local EOC make this decision. The final decision on state commitment of resources, if required, is made by the Governor's Office.

In the case of long-term supply disruptions, the State Energy Assurance Engineer within the Department of Commerce SEO is responsible for monitoring costs and availability of raw materials and energy. The office will use the guidelines established in the Supply Disruption Tracking Plan to monitor energy supply and costs.

Procedures for issuing a declaration

The Governor's Office is responsible for issuing an emergency declaration, but typically does not do so without IEMA first suggesting it. IEMA's role is to inform the Governor of to the extent of the damage based on reports from local EOCs, at the scene law enforcement, private sector partners, and regional IEMA coordinators.

Public information program

The SIRC and SEOC include staff from IEMA, the primary agencies, and other support agencies as required. They provide strategic and operational coordination for SIRC response activities as well as activities in the field. The SIRC serves as a central source of information on the status of state response activities and helps disseminate information to the Governor, the public, the General Assembly, Congress, and the media. PIO will be on duty at the SIRC when activation occurs. This person reports to the Governor's PIO who is responsible for deciding who in the public, private, and government sectors to contact with what information. No one else from the SEOC or state government besides the Governor or a designated PIO should be issuing statements or be contacted during a disruption.

Section Three. Individual Energy Source Response Plans

Monitoring system

The three primary components of the monitoring system for the State of Illinois are field identification of energy disruptions, analysis of disruption predictions, and geospatial monitoring. They encompass all four of the state's major energy sources (petroleum, natural gas, electricity, and renewables).

Field identification

Disruptions to energy supplies, especially those from damage to infrastructure, are often discovered by first responders (police or fire), local EOC personnel, or personnel from the energy provider. IEMA provides training for all local EOC personnel and law enforcement on how to identify, report, and respond to energy disruptions. For instance, once turned off, natural gas pipelines should only be turned back on by a trained representative of a gas utility; and, of course, electrical wiring should never be touched unless by those trained to understand and handle the equipment.

Local EOC, first responders, and energy provider personnel are also trained on the proper communication steps to take when an energy disruption is discovered. Criteria for when the state must be contacted in the case of a pipeline leak or a power outage and information on who to contact and how to make that contact is provided. The IEMA Communication Center has a 1-800 number that is manned 24 hours a day for reporting energy emergencies and requesting information.

Analysis of disruption predictions

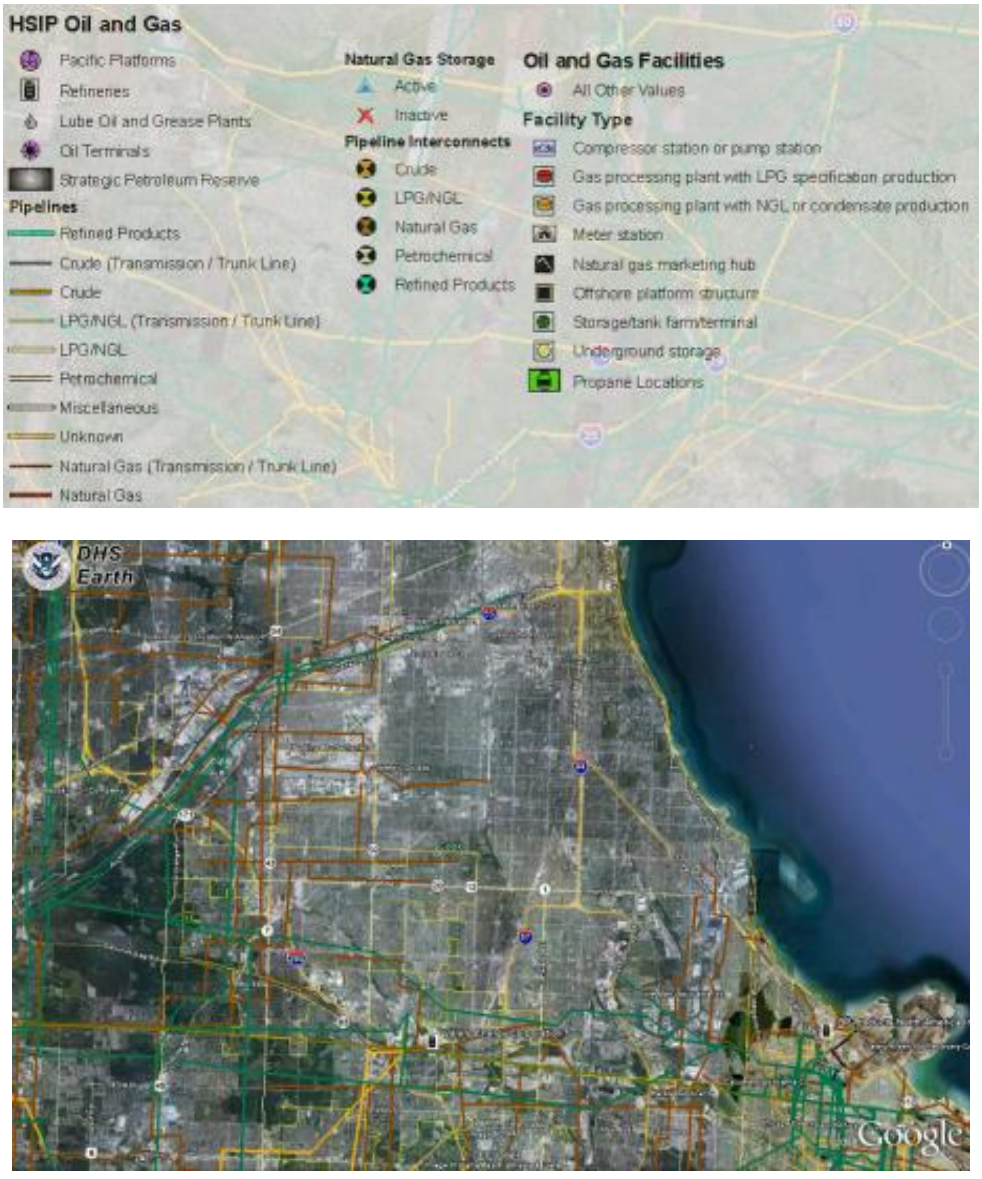
Analysis focuses primarily on monitoring and preparing for energy price increases or supply shortages, a function for which the SEO is responsible. The State EAE has access to a number of free and subscription sources listed in the supply disruption tracking plan, as well as a list of contacts (Appendix 4) within the industry who have agreed to be available to the state if the office should have any questions or concerns. These contacts' livelihoods depend on an accurate assessment of energy prices, and they understand that the state requires this information in times of emergency for restoration efforts.

In addition, the State of Illinois is now participating in the U.S. Energy Information Administration's State Heating Oil and Propane Program (SHOPP). This program monitors retail price and supply of propane in Illinois in order to proactively identify future price spikes or supply shortages. This program is managed through the Department of Commerce.

Geospatial assessments

The state has developed an energy assurance GIS database (see section five of this plan) which includes the most appropriate layers for monitoring energy infrastructure. The database contains critical energy infrastructure from across the state. IEMA GIS Specialists plan to use the infrastructure layers in exercises to predict damage as well as use the data during actual emergencies to better understand possible outages, areas of impact, and potential damage so they can assist the ICC, IDOT, the Department of Commerce and IDOC in restoration efforts. The SEO has worked with Envision MapSearch, ArcGIS, DHS Earth and iCAV (Figure 9).

Figure 9: Example of iCAv layers for Chicago, Illinois.



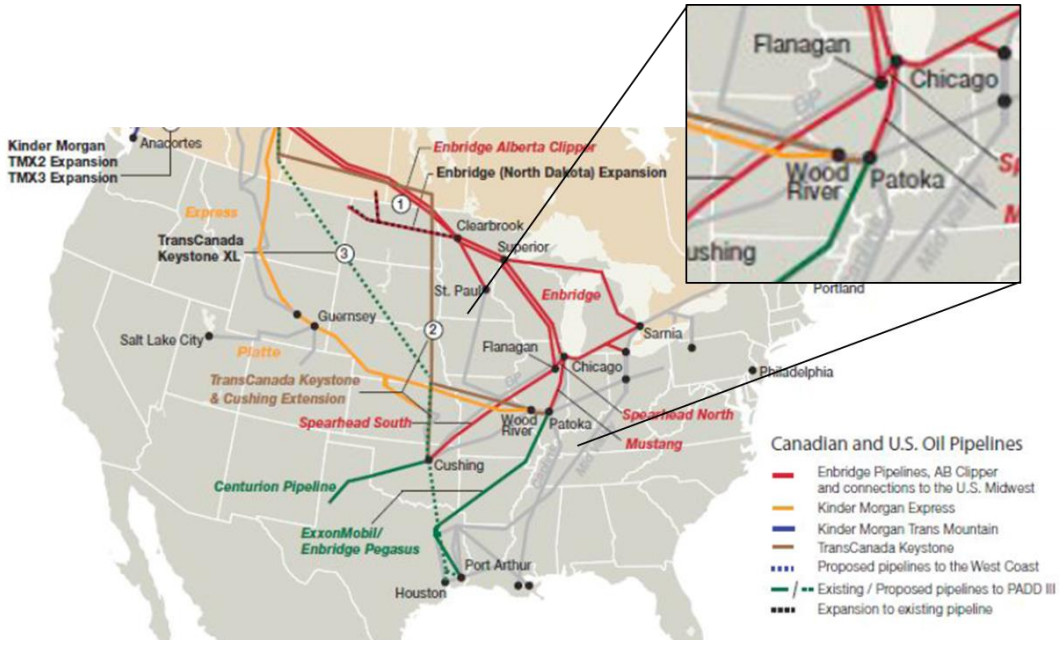
Petroleum (gas, diesel, heating oil, propane, ethanol, etc.)

Description of location, capacity and throughput of infrastructure

Up until the early 1970s, Illinois was fifth in the nation in petroleum production. It has since tapered off, and in 2010 the state was ranked 14th, producing only 759,000 barrels while consuming 254 million barrels a year (4.8 billion gallons of gasoline). However, as of 2015 Illinois has the largest crude oil refining in the Midwest and the fourth largest in the U.S. As a result, the state imports the vast majority of its petroleum, most of which now comes from Canada through the Enbridge Pipeline.

Petroleum transported into Illinois comes almost exclusively from pipelines. There are two primary types of petroleum pipelines: those that transport the crude oil to facilities where it can be refined into useable products such as gasoline, diesel, propane, and heating oil (refineries), and those that transport the finished product to distribution facilities. A pipeline could be used for both, but this is rare and requires special cleaning. Illinois has a number of petroleum pipelines coming into and out of the state. There are two areas in the state where a number of pipelines converge: in the southern part of the state near Patoka where a large crude oil storage farm exists and is used by multiple companies and along the Illinois border near St. Louis, Missouri (Figure 10). Disasters affecting pipeline flow in these areas could seriously reduce petroleum supplies. Pipeline companies must adhere to National Transportation Safety Board (NTSB) safety guidelines.

Figure 10: Locations of Major Petroleum Pipelines in U.S and Illinois.



Petroleum spills are considered hazardous waste, and as such, must be reported to the IEMA Communications Center. Also, the oil spill response section of the Illinois Environmental Protection Act requires anyone owning facilities, a tank or a pipeline which results in a leak to report the leak to the Illinois Environmental Protection Agency. Once a pipeline is shut down for repair or because of a leak it must be re-inspected before it can be turned back on. The Pipeline and Hazardous Materials Safety Administration of the US Department of Transportation must inspect the line before it can be used again. Many, but not all, pipelines have automated pressure valves that detect and report when pressure climbs or descends rapidly indicating a potential spill or pressure build up allowing the company to rapidly locate and repair a leak, but a large leak could impact supply and pipeline leaks often lead to gasoline price increases. It is important for the Department of Commerce Energy Assurance Engineer to be notified of leaks and start monitoring the gasoline prices for spikes which, if significant enough, could be reported to the Governor. On July 24, 2012, the Governor of Michigan, Rick Snyder, declared an energy emergency and waived driver hour limits after a leak in Wisconsin led to a shortage in supply in the upper peninsula of the state.

As of 2014, Illinois has 4 petroleum refineries which process on average 958,000 barrels of oil a day plus a 5th facility just across the state line in Whiting, Indiana, which produces 405,000 barrels a day. The Conoco Phillips Refinery near Wood River produces the most at 306,000 barrels a day. The Marathon, Conoco, and BP refineries provide most of the fuel for the state of Illinois. While the media persistently mentions that no new refineries have been built in the U.S. in recent years, refining capacity is in excellent shape and always improving to meet demand. Illinois refinery capacity has actually been above demand recently because of reduced gasoline use during the economic downturn.

Ninety-five percent of the state's gas stations are independently owned. Gasoline goes from the refinery as a "raw" gasoline product (no additives) to a terminal where it is mixed to a gas station's specification. Even though a gas station may be affiliated with Shell or BP, the gas may come from any refinery: it is the additives mixed at the terminal that make it "BP" or "Shell" gasoline. The refineries in the state are using more and more heavy crude from Canada which is now the nation's number one oil provider. Ninety percent of Illinois oil now comes from Canada. Any new state regulations on Canadian crude could impact Illinois petroleum supply. The Conoco Phillips refinery has just added the facilities to take Canadian heavy crude, so all four state refineries can now process that oil. Changes to state regulations regarding this oil type would increase gasoline prices.

As mentioned, the state is transected by a number of petroleum pipelines. Disruption to one pipeline may increase prices and reduce supply, but petroleum for pipelines can often be rerouted. If a shortage from the Gulf (where oil comes in from foreign countries) or Canada

occurs, the refineries can compensate to some extent by sending petroleum originating from another location to that pipeline. The biggest concern with petroleum disruption for Illinois is electrical outages from hurricanes in the Gulf because electricity is needed to pump the petroleum from the Gulf states to Illinois. Most shortages from refinery capacity interruptions or pipeline leaks will be temporary, but a large-scale disaster or multiple problems could result in longer term price hikes. It is important that the energy assurance engineer have the contacts for the refineries available to call quickly to determine capacity and issues at all four refineries and multiple pipelines if one has a problem to ensure re-routes can address the problem. The contact information for the Petroleum refineries and the finished gasoline terminals are included in the supply disruption tracking process plan.

The state can occasionally help the petroleum industry by providing waivers for gasoline mixes. Large metropolitan areas require different mixes (especially in summer). In the case of a hurricane or a downed refinery, not enough fuel can be mixed for the requirements of the metropolitan areas. The Illinois Petroleum Council (IPC) has served the Illinois refineries in the same capacity as IMUA or IECA has the electrical utilities, by contacting the EPA to request a waiver for multiple refineries. These waivers require the Governor's signature and are only signed during a justifiable petroleum shortage. The Department of Commerce SEO will work proactively with IPC to have the proper communication channels in place to expedite future waiver requests when appropriate.

State emergency response plan

CMS has contracts in place with several petroleum product terminals and with several gasoline and diesel transportation firms. In an emergency, if transportation fuel is not available at the site of the event, CMS SIRC personnel will contact these contractors and request trucks be sent to key locations identified by the Incident Commander at or near the UAC. The trucks, which will purchase fuel at state petroleum terminals, will serve as re-fueling stations for state, local, and private sector disaster responders. CMS can also provide state gasoline credit cards that can be shared with state personnel (and the private sector in emergencies) and has access to which gasoline stations are open during a disaster event. IDOT also has fuel in storage in case of shortages for their vehicles which they could also share in an emergency event.

Currently IEMA is working on an emergency fuel supply plan that is slated as an appendix to ESF-7. Though this plan is currently under construction the goals of the plan are to ensure fuel availability for first responders and the general public during large scale emergencies requiring population evacuation. The energy assurance plan will be updated to reflect the final fuel supply plan when that time arises.

Monitoring supply and demand

Being so closely associated with the price of gasoline, petroleum prices and supply are closely monitored and discussed on a daily basis by major media outlets. Price per barrel is often listed

on news programs, and changes in the price of gasoline are commonly listed on websites such as gasbuddy.com. Sudden increases in the price of gasoline may be a sign that oil supplies have gone down or the potential for disruption exists as this market reacts quickly.

Illinois leads the Midwest in refining petroleum into products (gasoline, diesel, propane, heating oil). The state had an oil reserve of 42 million barrels in 2013. This amount varies by year and is monitored by the energy assurance engineer.

The DOE Energy Information Administration (EIA) has data on many different components of petroleum supply, sales, and sources including a petroleum status report, pricing reports for gasoline, diesel, heating oil, and propane, and an import report. The EIA publishes a report on first sales of petroleum products directly into states which could be useful in calibrating new supplies of petroleum coming directly to the state. The EIA also publishes a report on petroleum wholesale and retail prices at the state level. Petroleum inventory and production is also monitored and reported by EIA at the regional and national level. All of these reports may be used to monitor current supply and use and predict changes in supply and pricing which could be indicative of supply or future shortages. The American Petroleum Institute also provides a number of sources of information regarding petroleum supplies, gasoline prices, and imports.

Of course, as is the case with other energy supplies, contact with industry is essential. Existing industry contacts such as the Illinois Petroleum Council and the refineries themselves should be contacted by the energy assurance engineer if a disruption seems to be looming.

Understanding the impacts of weather on heating oil and propane sales and prices and understanding peak gasoline use periods can also help when monitoring demand for petroleum products. Long cold spells may lower heating oil supplies and peak summer vacation and holiday travel periods may lower gasoline supplies. When combined with a disruption, the effect from these situations on energy assurance will be more extreme. In early 2014 Governor Pat Quinn declared a propane emergency due to supply shortage caused from severely cold weather. This declaration resulted in hours of service waivers for propane truck drivers. Because of the severe supply disruption in the Winter of 2013-2014 Illinois is now a participant in the EIA's State Heating Oil and Propane Program (SHOPP).

The SHOPP requires the state energy office to survey retail propane sellers on prices and supply during the heating months. This information allows the state to proactively manage future shortages or supply disruptions. During the heating season the EAE receives a weekly report from the energy assurance analyst on the market conditions of propane.

The EIA publishes a list of operable refineries that can be used to determine where oil is being converted to gasoline, diesel, propane, and heating oil. Oil pipeline information is available from iCAV, DHS Earth and through weekly reports purchased from the Oil Pricing Information Service (OPIS). Illinois is a major transportation hub for crude oil. Several crude oil pipelines

terminate in Illinois making this a point of concern for disruptions to petroleum supplies not only in Illinois but surrounding states.

State efforts to reduce consumption and provide alternate energy sources

Illinois, often first or second nationally in corn and soybean production, is a good location for the production of corn ethanol and soy bio-diesel. Current ethanol production in Illinois is greater than 860 million gallons per year. Plants often keep ethanol in storage at the facility. CHS Inc. (formerly Illinois River Energy), for example, reports keeping 300,000 gallons of ethanol in reserve at all times. The Governor of Illinois has the authority to suspend the blend wall (the percent of ethanol to be added to gasoline) in times of emergency, allowing for more ethanol to be used in replacement of gasoline for fuel. Use of increased blends of ethanol can offset the use of conventional gasoline. In the event of a petroleum product supply emergency, Illinois could request a fuel waiver from EPA to temporarily grant approval of statewide use of E15 (15% ethanol blend) for us in all conventional vehicles. (The blend is currently at 10% for most Illinois gasoline.) This could make ethanol a viable alternative to gasoline in times of emergency, but would require approval from the U.S. EPA. Furthermore, not all car engines have the ability to handle increased ethanol blends. Also, ethanol, while stored at the production facility, may already be committed to customers, making it difficult for the state to access. The state is considering encouraging the development and deployment of blender pump infrastructure to allow widespread distribution of E15, E20, E30, E40, and E85. Currently only 5 percent of the 4,400 retail fueling stations in Illinois are E85 stations, and only 6 have blender pumps.

The state also encourages citizens to voluntarily reduce gasoline consumption by using public transportation, bicycling, or car pooling. IDOT has a webpage dedicated to bicycle use, safety, and routes and has funding for the development of bicycle routes; it also has a webpage promoting and encouraging the use of Amtrak. The state has incentives for electric vehicles for car sharing organizations and alternative fuel vehicle and alternative fuel rebates as part of the Illinois Green Fleets Program. IDOT has conserved fuel in the past during high gasoline prices by reducing the number of times they mow interstate and state highway right of ways.

Legislative actions to assist in restoration, supply and pricing

Driver hour waivers

IDOT is responsible for issuing driver hour waivers for propane and petroleum truck drivers during inclement weather to ensure rural residential customers receive propane for heating fuel and gasoline stations receive fuel. The waiver must be approved by the Governor. The National Propane Gas Association posts the current status of driver hour waivers in each state. Waivers are often granted in the winter. The SEO will assist IDOT and the Governor's Office in understanding propane supplies, petroleum supplies, weather, and the need to allow the waivers.

Fuel specification waivers

The U.S. EPA can grant fuel waivers in a gasoline or diesel supply emergency. Two areas in Illinois have requirements for reformulated gasoline (RFG): the Chicago area and the Metro-East (near St Louis) area.[4] In emergency situations, the U.S. EPA has the authority to grant waivers for the RFG requirement and allow the use of conventional gasoline. U.S. EPA can also consider, on a case-by-case basis, allowing higher blends of corn ethanol or higher sulfur diesel fuel. In both cases, engine warranties and life-time will impact the consideration of granting such a waiver. EPA's Office of Enforcement and Compliance Assurance (OECA) should be contacted in this case at (303) 312-7153.

During this process, the Illinois EPA serves as an advisor to the U.S. EPA and the OECA. Therefore, in any emergency situation, the Illinois EPA should be contacted. Ultimately fuel waivers are granted by the U.S. EPA. In the case of an RFG waiver by the U.S. EPA, the Illinois EPA's volatility standards for Metro East will still need to be waived. However, this standard is expected to be discontinued.

Finally, in case of a fuel waiver, the Bureau Chief with Illinois Department of Agriculture: Bureau of Weights and Measures will need to be contacted as that office ensures that all fuels meet the stated blending limits. The Illinois Department of Agriculture will be in close contact with the Illinois EPA in case of an emergency situation.

The state has legislation in place that requires state agencies to purchase Flex Fuel Vehicles (FFVs); additionally FFVs account for more than 300,000 registered vehicles in state. FFVs can use higher blends of ethanol (up to 85%).

Finally, if a disaster is declared, the Governor has the right to 1) freeze prices of petroleum products to prevent rapid increases in a shortage 2) prosecute price gouging if proven, and 3) acquire petroleum products to be used in an emergency from private sector providers. While it is hoped these never have to happen, it is critical the energy assurance engineer understand supply, potential impact of disruptions and price increases to best inform the Governor.

Natural gas

Description of location, capacity, and throughput of natural gas infrastructure

Only 35 operating natural gas wells produce natural gas in Illinois, but the state is a major transportation hub for the natural gas supply moving through North America. Major natural gas pipeline systems from the U.S. Gulf Coast, U.S. midcontinent regions, and western Canada converge at the Chicago Hub and the ANR Joliet Hub. From there, natural gas is transported to consumption markets in the Midwest and Northeast. In June 2009, a section of the eastern leg of

[4] Cook, Du Page, Grundy (Partial), Jersey, Kane, Kendall (Partial), Lake, Madison, McHenry, Monroe, St. Clair, and Will Counties.

the Rockies Express Pipeline system from Colorado and Wyoming began delivering additional natural gas supplies to Illinois increasing supply further. To meet peak demand during the winter, Illinois stores natural gas in natural aquifers and depleted oil or natural gas reservoirs. Underground natural gas storage capacity in Illinois is second only to that of Michigan. The residential sector leads natural gas consumption in Illinois, with more than four-fifths of Illinois households relying on the fuel as their primary energy source for home heating.

ICC is responsible for inspecting intrastate natural gas pipelines following federal requirements. ICC is only contacted by the pipeline company if there is an incident, rather than a disruption, and then only when the incident is significant. The federal government monitors interstate natural gas pipelines, petroleum and other hazardous liquids. If there is a shut-down because of an earthquake or other possible damage, the utility will inform the ICC and possibly PHMSA to determine the extent of the damage and actions to be taken in response to the outage. In the case of a disruption or a shortage, the utility decides which customer services to curtail or terminate. Typically, businesses are shut off first. All federal pipeline regulations were put into place in 1970. Amendments to the 1970 act are added based on incidents with a death and/or property damage exceeding $50,000, National Transportation Safety Board ("NTSB") recommendations, and recommendations from other sources, including natural gas operators. Pipeline operators are responsible for maintaining records for meeting both federal and state requirements. Older pipelines can be cast iron, ductile iron, bare steel and PVC. Newer pipelines are polyethylene, which is more resilient. Some pipelines have the ability to monitor the pressure remotely. ICC performs inspections of pipelines and issues notices of probable violation when it is determined the pipeline is not operating in a safe manner.

The utilities own storage facilities and store natural gas at the beginning of each winter, but they do not own all of the supply coming into the state in pipelines. Some of the gas is committed to large in-state customers who transport their own gas. For pipelines whose facilities do not terminate in the state, parties outside of Illinois own a portion of the gas in the pipeline. It would be difficult for Illinois utilities to gain access to that natural gas. A common misconception for natural gas pipelines is that flow slows down in the summer. According to the natural gas companies, flow is pretty steady throughout the year, as summer months are used to replenish storage for winter.

Monitoring supply and demand

Over 80% of the state's households rely on natural gas for home heating, and home heating is the primary use of natural gas in Illinois. The natural gas market is more difficult to monitor than petroleum. However, there are some helpful tools available. The EIA publishes a monthly report on natural gas inventories and deliveries to industrial, commercial, and residential customers, on withdrawals from underground storage, and on pricing. This information is compared to previous years and 4-month averages and can be used to identify trends in price and use. Also, according to the National Association of State Energy Officials (NASEO) Energy

Assurance Guidelines, we can monitor changes in natural gas supply by looking at two other indicators: spot and contract prices and curtailment notices. Curtailment involves requests by the natural gas supplier to reduce use; however, these requests are very rare. If sent, they are usually sent to large users such as industry as opposed to homeowners. Weather will also need to be watched as long-term cold spells may reduce supplies. To meet peak demand in the winter, the state stores natural gas in natural aquifers and depleted oil and natural gas reservoirs, but a disruption in a pipeline or accidental release of this gas could cause a shortage. While the State EAE monitors weather daily for a variety of reasons, s/he will watch specifically for a prolonged cold spell late in the winter when supplies may be low and then work with the natural gas companies to suggest reduced use to the public to avoid curtailment requests. If utilities and analysis indicate supplies are getting low, the state may request that citizens reduce use. This will be done via a press release from the Governor's Office.

The ICC publishes an annual report that lists the natural gas providers in the state of Illinois (9 as of 2014) and divides it by region and lists costs to consumers. Contacts exist with the natural gas industry personnel for each of these companies, and they share information on supplies and in-state demand.

The previously mentioned ICC report offers information on companies that distribute and sell natural gas by region in the state of Illinois. Natural gas pipelines, similar to petroleum pipelines are also available for viewing from iCAV and part of the Illinois Energy Assurance GIS database. Similar to petroleum, Illinois is a major transportation hub for natural gas. Several natural gas pipeline systems converge at Chicago, including systems whose gas sources originate from the Gulf Coast, western Canada, and U.S. MidContinent region. As noted above, starting in 2009, a pipeline that sources its gas from Colorado and Wyoming built across the middle of Illinois.

Electricity and electricity energy sources

Infrastructure description

Between large coal reserves and an active nuclear generating industry, Illinois seems to have ample materials for electricity generation. However, the state's estimated recoverable coal reserves represent more than one-tenth of the U.S. total, only a small fraction of those reserves are located at producing mines. Currently Illinois ranks 4th in coal production. Illinois delivers more than one-half of its coal output to other states, including Indiana, Tennessee, Florida, and Missouri. Illinois also receives coal from other states, particularly Wyoming, and uses that coal to generate electricity. Most of this coal is shipped into the state via rail. Much of the coal leaving the state is sent via rail or barges down the Mississippi River.

Coal plants have been and may be closing down as new environmental regulations go into effect. These new regulations include EPA's Cross-State Air Pollution Rule (CSAPR) (taking effect in 2015), the Mercury and Air Toxics Standards (MATS) (requiring compliance before April 16, 2017), and the EPA's proposed Clean Power Plan (CPP) (which would regulate green-house gas emissions from power plants, starting in 2020).

Currently, Illinois is one of the top electricity-generating states in the nation and a leading net exporter of electricity to other states. Coal and nuclear power generate over 95% of the electricity in Illinois, with a near even split between the two fuels. With 11 operating reactors at 6 nuclear power plants, Illinois ranks first among the states in nuclear generation and generates more than one-tenth of all the nuclear power in the United States. The growth of the Illinois nuclear industry is due largely to state government initiatives, which began encouraging nuclear power development in the 1950s. IEMA and the state take rigorous steps to ensure the nuclear power generating facilities stay safe. This is an active 24/7/365 operation with a control room at State Emergency Operations Center that constantly monitors all the plants. They also train three times a year with various disaster scenarios. The nuclear plants all run close to 100% capacity year-round. There are no plans for additional plants to be built, but these plants consistently increase capacity and efficiency. The plants have been applying for and receiving extensions based on their safety record and continuous infrastructure updates and monitoring.

Nuclear plants must monitor the temperature of their cooling lakes; if they rise over a certain temperature in summer months, the facility has to cut back production to avoid fish kills. This rarely happens, but could be monitored and predicted with weather data. An additional problem is that when the grid is shut off, the nuclear facility has to shut off and then restart. It cannot function separately from the grid as it would have no place to send generated electricity, and the backup diesel power generation is insufficient to power the plant. Nuclear facilities have no "black start" capabilities.

Retail electricity providers obtain electricity from wholesale electricity markets, such as those operated by PJM and MISO. PJM and MISO monitor the electric grid (generating plants, transmission lines, etc.) very carefully to ensure electricity keeps flowing without interruption. The monitoring system uses multiple control rooms that watch the grid for problems and let utility companies know what needs to be repaired. They call the generating plants and tell them what capacity to operate at each day and make infrastructure improvement and resiliency plans each year, which they submit to the utilities and are generally implemented. They monitor the price of supplies such as coal and natural gas, including monitoring days of supply and long-term use, as well as monitoring and modeling weather to anticipate increases in demand. These companies try to manage the electricity generated with consumer needs. Generating electricity that is not used cost the company's money so they try to anticipate needs and generate accordingly. They have assured energy assurance personnel that the grid in Illinois has built in redundancy and strong resiliency, but have also told the state they will contact state personnel if

the load challenges capacity. They put out annual reports that summarize this information and are available to the state and public. Finally, these companies have detailed cyber-security plans in place.

The state has partial control over electricity rates. They can control the price utilities charge to transport electricity and natural gas and to maintain the infrastructure (wires and pipes, which are less than half the cost to the consumer), but they do not control the cost of the energy itself. The state cannot tell utilities to build new generating facilities. Essentially, the state cannot regulate the cost of electricity or the amount that is generated in Illinois. For municipalities that handle their own electricity, the state has even less control. If the wholesale distributors were to increase prices the only alternative consumers would have is to reduce use. However, NERC and FERC could get involved, and the state could work with the wholesalers and utilities to find ways to reduce costs.

In August 2007, Illinois adopted a statewide renewable energy standard requiring the state's utilities to produce at least 25% of their power from renewable sources by 2025; 75% of the electricity used to meet the renewable standard must come from wind; other eligible sources include solar, biomass, and existing hydroelectric power. The law also includes an energy efficiency portfolio standard that requires utilities to implement cost-effective energy efficiency measures to reduce electric usage by 2% by 2015.

Monitoring supply and demand

All electrical sales are reported to the EIA including sales of electricity generated from renewable energy at the state level for biomass, wind, geothermal, and solar. The site also gives information on sources for electricity generation by state, which allows the tracking of use of specific energy sources (such as coal and natural gas) and the monitoring for reduced supplies of the raw materials for electrical generation. The EIA publishes a quarterly coal price and inventory report which allows monitoring of coal supplies, availability, and use, including the number of in-state days of supply. Illinois has large coal reserves, but the coal is high in sulfur and must be mixed before combustion with low sulfur coal from the western U.S. (primarily Wyoming) to meet regulations. Power plants could also install clean coal technology, such as scrubbers, which would allow power producers to comply with air emissions standards.

Other data provided by EIA for electricity supply includes an annual inventory of power plants in the United States. While the publication has been discontinued, it contains historical data on electrical generation by state and by energy source for gas, coal, petroleum, and hydroelectric.

The U.S. EPA's Emissions and Generation Resource Integrated Database (eGRID) also produces a database which contains all electricity generating plants, their net generation of energy by source by year (coal, nuclear, biomass etc.), and the plant's location including latitude and longitude coordinates which will allow for input into a geographic information system for

mapping purposes. Transmission lines, power stations, and other electrical grid information are available for viewing on the energy assurance GIS database (see Section 4).

Other useful information for tracking potential electricity demand includes weather information, available online from a number of sources. Long-term forecasts of high summer or low winter temperatures may indicate increases in demand.

Specific to Illinois, the ICC publishes reports on electrical sales by year broken out by company, price, and user (retailer, commercial, public, etc.) The data is divided by region and could give insight into regional use and demand.

Because such a high percentage of Illinois' electrical energy is produced using nuclear power, this will require special attention. Neither the source of nuclear power generation nor its price is expected to be an issue, but other factors, such as reactor failure or terrorism need to be considered. Illinois has 6 nuclear facilities with 11 reactors.

State efforts to reduce consumption, alternate energy sources for natural gas and electricity

Renewables

The two primary components of Illinois's renewable energy portfolio are electricity, from wind and solar power, and bio-fuels for transportation from ethanol (primarily from corn) and bio-diesel (primarily from soybeans). EIA reports minimal use of hydro-electricity in Illinois. Table 1 indicates that in 2012, just over 5% of the state's total energy was provided by renewable sources for electricity, and, in 2010, the state's capacity for renewable electricity generation was 2,112 megawatts. Illinois' renewable energy standard requires the state's utilities produce 25% of their electricity from renewable sources by 2025. Much of this is expected to come from wind.

The site www.windpoweringamerica.gov offers information on potential wind power generation in Illinois. This site estimates close to 250,000 megawatts of electricity could be generated from wind energy in Illinois. The American Wind Energy Association shows current wind projects by state, county, and even by project with megawatt potential for each project.

Combined heat and power

Combined Heat and Power (CHP) systems have the capability, under certain configurations, to continue to safely operate and provide electric service to a facility during emergency situations (extended electric utility outages). In Illinois there are currently 138 CHP systems operating with a total installed capacity of 1,360 MW (Table 9). The US Department of Energy estimates that the total CHP potential for the state is between 3,000 MW and 8,000 MW from fossil fuel sources. The US DOE Midwest CHP Technical Assistance Partnership estimates that an additional 3,000 MW could come from agricultural sources (farm digesters, corn stover gasifiers

integrated with CHP systems). The majority of the CHP systems installed in Illinois are equipped with black start capabilities and synchronous generators, which allows the CHP system to serve the facilities' load in case the electricity grid de-energizes.

In 2014 the Department of Commerce released their Public Section CHP Pilot Program. This program offers incentives towards the design, construction and implementation of efficient CHP systems. Shortly thereafter the ICC accepted a statewide efficiency calculation methodology for CHP so that utilities may include CHP in their efficiency portfolios. Though these programs are new they are important for their contribution to energy security in Illinois. When possible the Energy Assurance Engineer should work with the state and private sectors to encourage CHP at critical facilities.

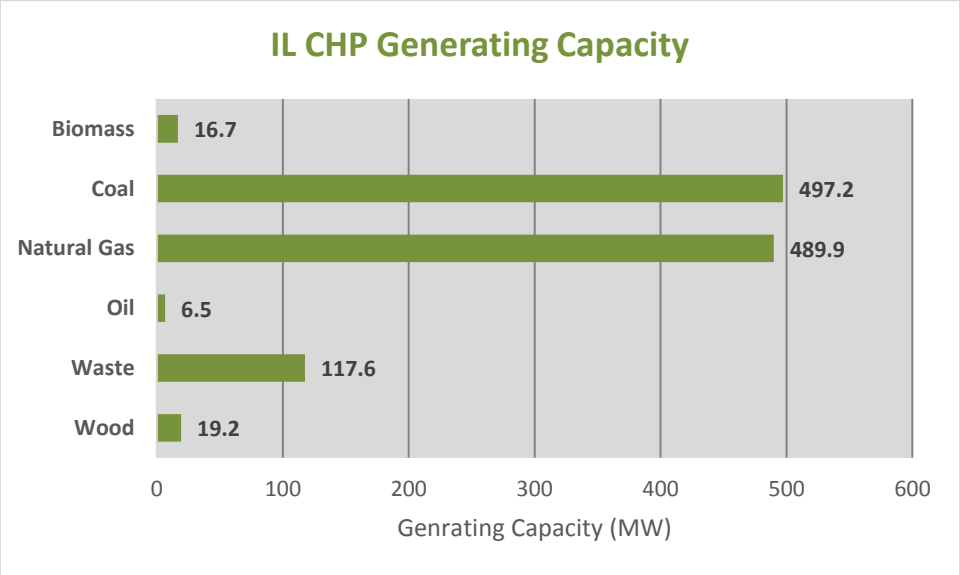
Table 9: Installed CHP Systems in Illinois.

Adkins Energy LLC	Jacobs Energy Corporation
Archer Daniels Midland Company	John Deere Corporation
Adventine Renewable Energy	ExxonMobil
All Rental Garment Company, Inc.	Jones Family Farm
BP Amoco Chemicals Company	Klein Tools
Apex Pork	KMS Joliet Power Partners
Armour Pharmaceutical Company	Macomb Community College
Resource Technology Corporation	Museum of Science & Industry
Blue Island Phenol	Nalco Chemical Company
Brookfield Zoo	Navistar International Transportation Company
Bunge North America	New Horizons Dairy
C & F Packing	Nicor Gas
Carry Companies Of Illinois	U.S. Department of Veterans Affairs
Caterpillar	Equity Office Properties
Chicago White Metals	Celotex Corporation
U.S. Army	Panduit Corporation
Dixon Marquette Cement	Pekin Paperboard Company
East Balt Bakery	Quaker Oats Company
Equistar Chemicals	Scheidairy Farms
Equity Office Properties	Bio-Energy Partners
Fleischmann Kurt Matt Company	Solutia
Froedtert Malt Company	Tate & Lyle
FSC Paper Corporation	The Plant
General Mills	U.S. Steel
U.S. Navy	Viking Sales Group
Hunter Haven Farms	Warner-Lambert Company
Illinois River Energy	Wells Manufacturing Company
Illinois Tool Works	WRB Refining
Ingersoll Milling Company	Colleges/Universities (15)
Ingredion	Schools (19)

Interstate Brands Baking	Hospitals (15)
Ivex Corporation	Wastewater Treatment Plants (8)

The diversity of the fuel sources for CHP systems in Illinois is illustrated in Figure 11. As can be seen, either a natural gas or coal shortage would only affect a portion of the installed capacity, allowing the remainder to operate.

Figure 11: Diversity of CHP Fuel Supply.



The DOE Midwest CHP Technical Assistance Partnership closely monitors the supply diversity from CHP and total CHP potential for the State of Illinois.

Reduced use

There are several programs the state has developed to encourage consumers to reduce energy usage and cut energy costs for household or business. Below are some of the programs designed to help consumers reduce energy use and costs by eliminating energy loss and increasing efficiency.

- Ameren Illinois Act On Energy
- Anybody Can Serve
- Center for Neighborhood Technologies
- ComEd - Home Savings
- Illinois Home Weatherization Assistance Program
- KeepCool.Illinois.gov
- KeepWarm.Illinois.gov

Smart grid role

Smart grid technology encompasses a number of mechanisms that allow for better monitoring and delivery of electricity. Unlike natural gas or petroleum products, electricity cannot be stored effectively in large quantities. This requires electricity providers to produce the maximum amount of potential electricity which may be required at any given time to avoid brown-outs or blackouts. The smart grid 1) allows utilities to continuously monitor for outages and identify problems before they lead to outages; 2) allows for a feedback loop between electricity generators and consumers to allow (to some extent) electrical generation to be increased or decreased based on demand; and 3) better allows for the implementation of wind and solar power which, because of their intermittent contributions, offer new problems to a gridthat is designed for continuous electrical flows.

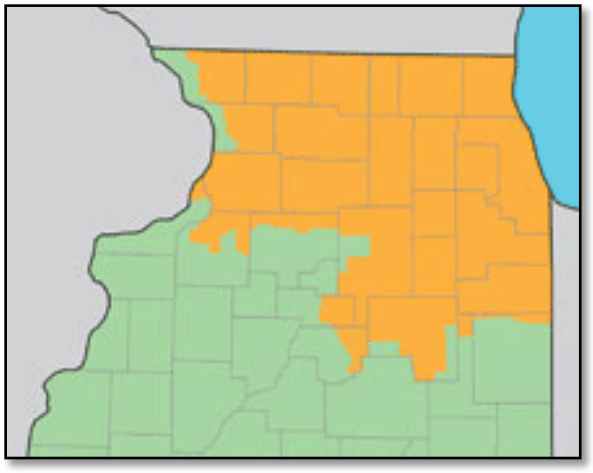
The ICC has developed a Statewide Smart Grid Collaborative Report that addresses the potential for smart grid technologies in Illinois. Two important components of the smart grid identified in the report were 1) smart meters for residential customers to allow customized delivery of detailed electricity usage data to monitor and respond to; and 2) synchro phasers, that allow continuous measurements of electrical flow along the grid for wholesalers to measure, monitor, and adjust output from generating facilities.

House Bill 3036 (Public Act 97-0646) was signed into law in December 2011 allowing Ameren Illinois and ComEd to implement smart grid technology for their portions of the Illinois electrical power grid. The bill, which had a previous version vetoed by the Governor, was somewhat controversial as some saw it increasing electrical costs to consumers without assured cost savings. It also circumvented the traditional process for utility rate increases through the ICC by asking for a flat increase to consumer utility bills to be directly implemented by the legislature.

ComEd has begun their $2.6 billion upgrade to the electrical grid they estimate will take 10 years to implement. An analysis performed by an independent firm for ComEd estimates the cost savings from the advance metering initiative (AMI) component of their smart grid upgrade would provide $2.1 billion in net benefits over 20 years and improve electrical reliability (the AMI component of ComEd's smart grid plans is estimated to cost $2.1 billion). According to ComEd, half of the cost is going to upgrade the physical components of their electrical system (new wiring, transformers, etc) that spans northern Illinois (

Figure 12). The other half is going toward the communications network that will be required in order for the smart grid to communicate detailed information regarding consumer use and the health of the electrical grid. The cost to consumers is three dollars a month.

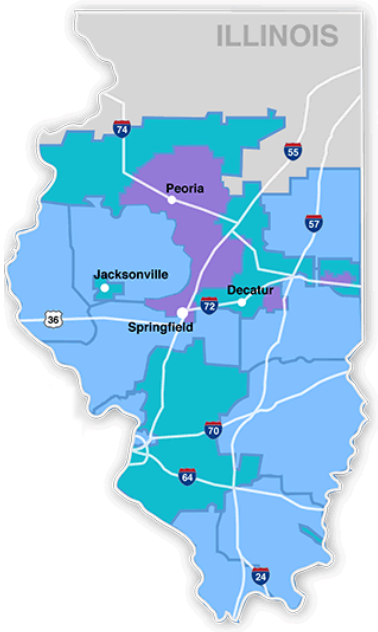
Figure 12: ComEd Electrical Services Territory in Northern Illinois in Orange.



Ameren Illinois' plans for smart grid upgrades include sensors placed along critical sections of the transmission grid to monitor conditions and prevent disturbances elsewhere from cascading into Ameren territories (

Figure 13). It will also assist in the incorporation of wind and solar power. Ameren's sub-stations will be upgraded to allow remote operation of switches and monitoring for outages that would allow the utility to switch to alternative power sources and avoid outages. Ameren will put monitors in place at the distribution grid level to allow for remote switching to alternative power sources and to switch the flow of power to avoid damaged areas. Ameren began smart meter deployment in June 2014. Ameren expects to conclude deployment in 2019.

Figure 13: Ameren Electrical Services Territory in Illinois.



Cybersecurity

All Illinois electrical wholesale (PJM and MISO) and utilities (Ameren and ComEd) are required by the Illinois Public Utilities Act to annually verify a cybersecurity plan is in place and tested. The ICC periodically meets with utilities to discuss theseplans. If ICC deems a utility or electricity wholesaler's plan to be insufficient to protect the public safety, they can request the utility enhance measures. The plans closely follow NERC Critical Infrastructure Protection (CIP) Guidelines as NERC has also asked for similar plans and does exercise these plans. NERC has established a number of CIP standards that address cyber-security, and utility and wholesaler plans closely follow and address each standard. Standards and sub-standards two through nine specifically address cyber-security. Critical components of the NERC standards that ICC emphasized include the development of more than one security perimeter (multi-layered security protections), and the identification and vulnerability assessment of critical assets (control centers). All Illinois utilities and wholesalers run their own exercises to test their systems.

A primary concern identified with smart grid technology is the potential for new system vulnerabilities with the addition of direct communication between the grid, the utility. And utility customers. Others may be able to access these communication pathways and cause areas of the grid to shut down or switch electricity routes, causing overloads. Multiple vendors are involved in the development of all components (hardware and software at control room and in field). Ameren Illinois and ComEd work closely with vendors to ensure these pathways are secure, compatible, and reliable. Each utility requires vendors to meet the NERC CIP standards. NERC has also been performing cyber-security exercises with Illinois wholesalers and utilities.

A major issue associated with cyber-security and the petroleum, natural gas and pipeline industries is the impact a cyber-attack could have on the SCADA systems that run much of the automated processes. Discussions with the Illinois industries have led to assurances that most SCADA devices are in closed environments and most control rooms have no access to the internet making a cyber-attack very difficult. Personnel from many of the energy sector companies in Illinois have met with the state regarding cyber-security and reporting breaches. While they are not required to do so, most companies have assured the state, they will report any issues.

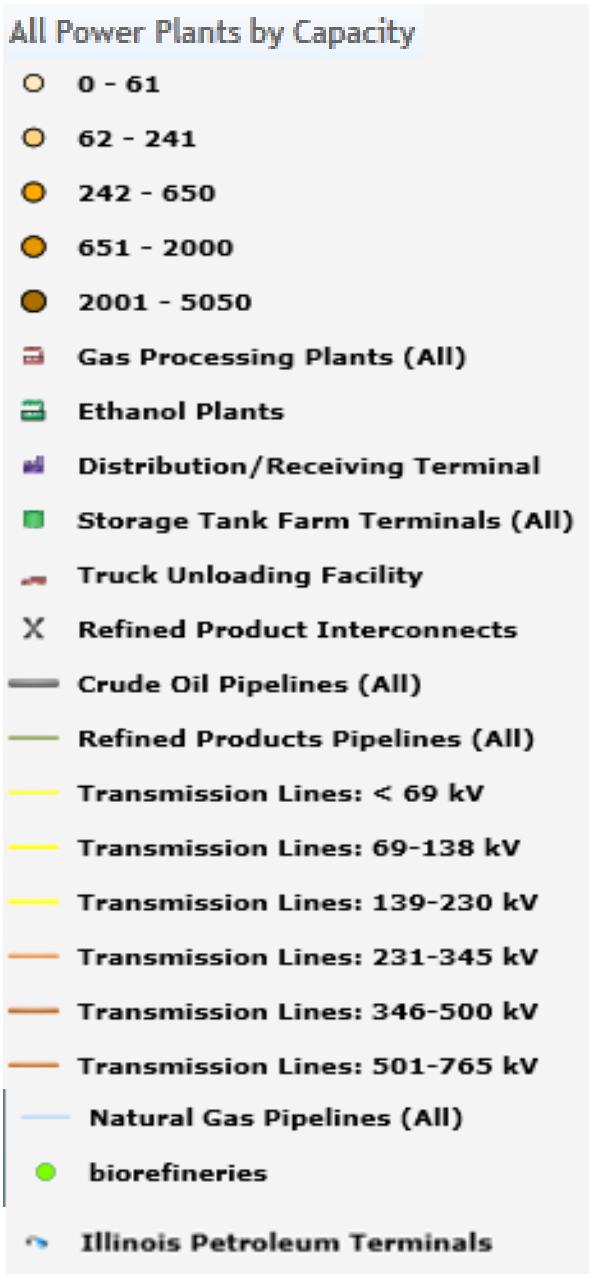
Section Four. Critical Infrastructure Plan

State plan for enhancing resiliency and protecting critical infrastructure

The Illinois Emergency Management Agency (IEMA) is the state agency responsible for coordinating disaster and emergency preparedness. IEMA, through the Illinois Terrorism Task Force (ITTF), develops and implements the state's homeland security strategy and administers federal preparedness funding. The Illinois Private Sector Alliance Project (PSAP) was launched in 2007 to integrate the business and nongovernmental sectors with government efforts in preventing, responding to, and recovering from catastrophic events. The PSAP exists under the ITTF and consists of two programs: the Infrastructure Security Awareness (ISA) Program and the Mutual Aid Response and Resource Network (MARN).

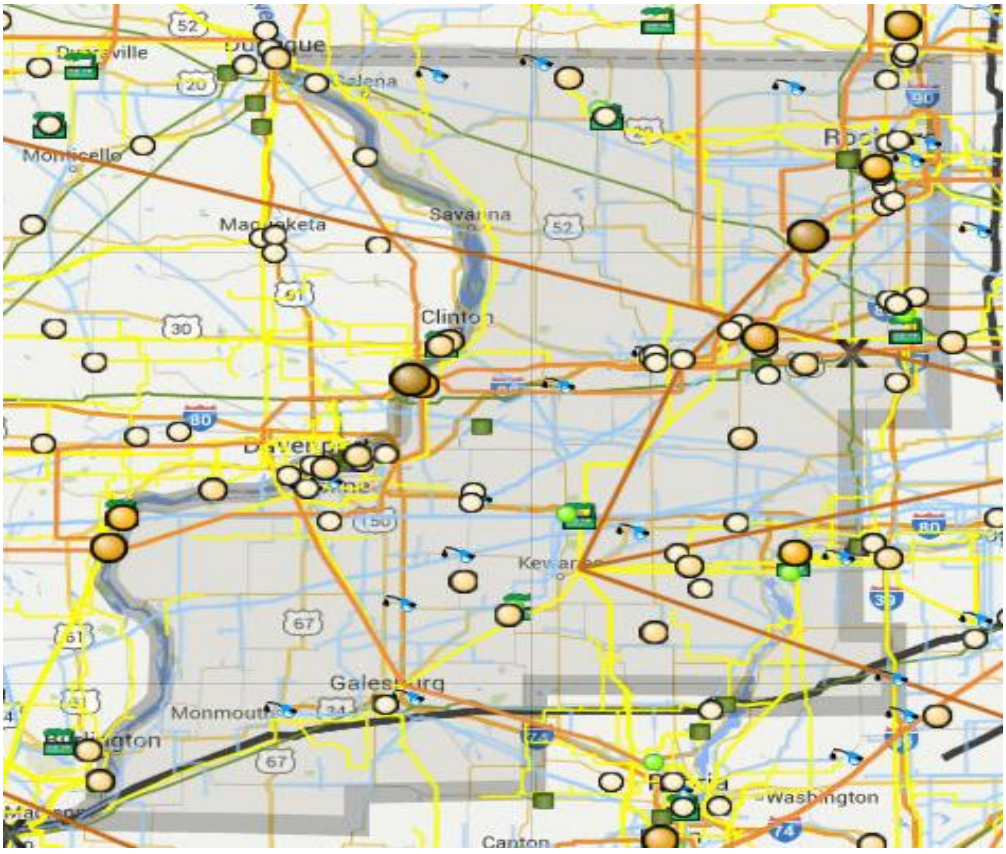
For the purposes of energy assurance, the state was divided into each IEMA region and its energy infrastructure (natural gas and petroleum pipelines, electrical transmission lines, refinery locations, electrical generating plants, wind farms) was mapped. The following is a breakdown of each region and the associated critical energy infrastructure. This plan has been disseminated to each IEMA Regional Coordinator, the Illinois Terrorism Task Force, and the Illinois State Police to assist them in their efforts to protect and respond to impacts to these infrastructure components.

Figure 14: Legend for Energy Infrastructure by IEMA Region.



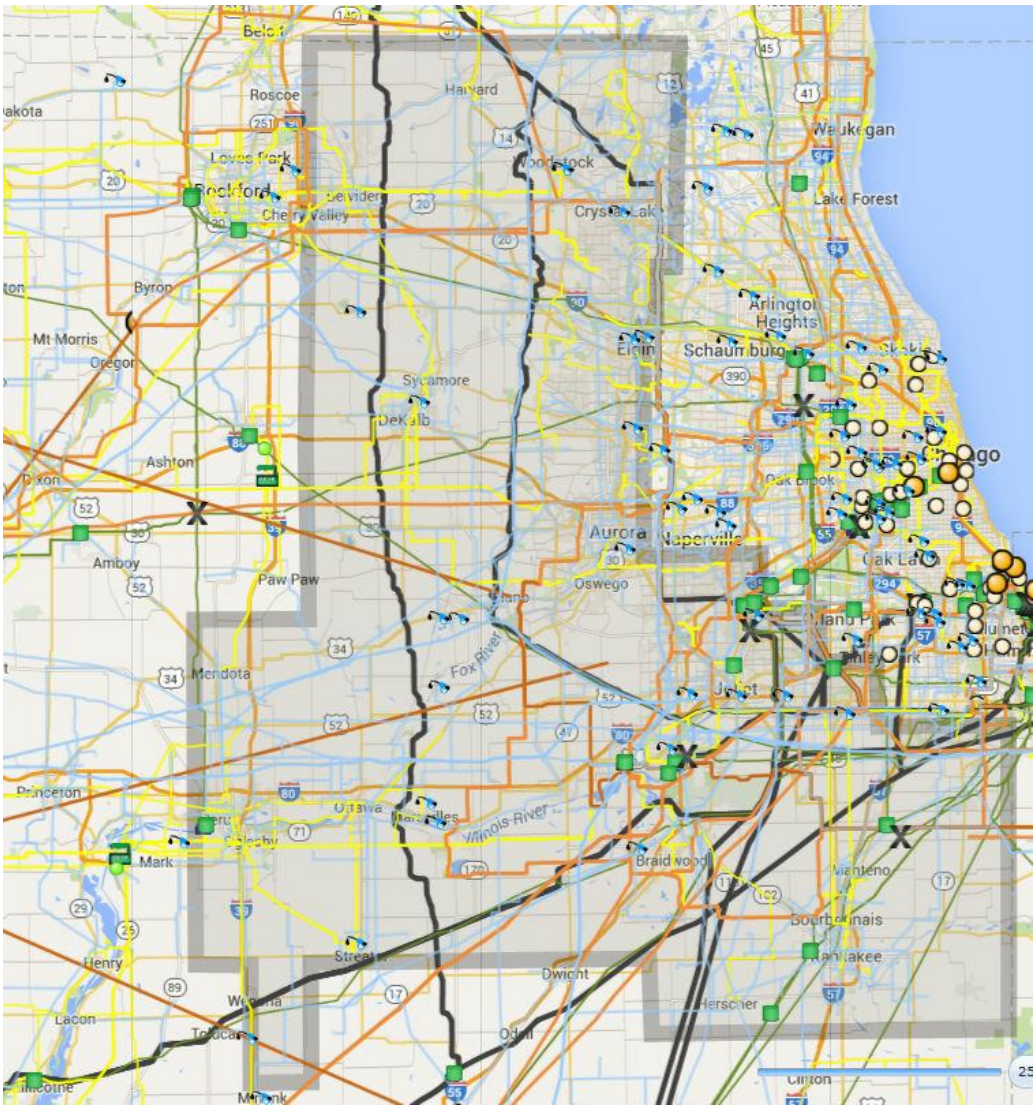
IEMA Region Two encompasses counties in northwestern Illinois. Major cities include Moline and Rock Island (Quad Cities area). The primary infrastructure concerns for this region include 9 wind farms, 2 nuclear electrical generating facilities along the Mississippi River, intersecting high voltage electrical wires, and petroleum and natural gas pipelines which feed large metropolitan areas like Chicago. A number of large natural gas pipelines intersect in this region, in particular midway between Sterling and Geneseo in the center of the region. Earthquake risk for this region is low but damage to these pipelines could reduce natural gas supply for not only the Midwest but East Coast also. There are no refineries in the region. Major electric suppliers are MidAmerican Energy, Ameren Illinois and ComEd. Major concerns for the region include severe storms and flooding. Wind farms can withstand very high winds, and the area is not at high risk for earthquakes, but the high number of wind farms means they should be considered when disasters occur. Wind farms may also interfere with radiation fallout should a nuclear accident occur. The location of wind farms in relation to the plume direction should be considered.

Figure 15: IEMA Region 2.



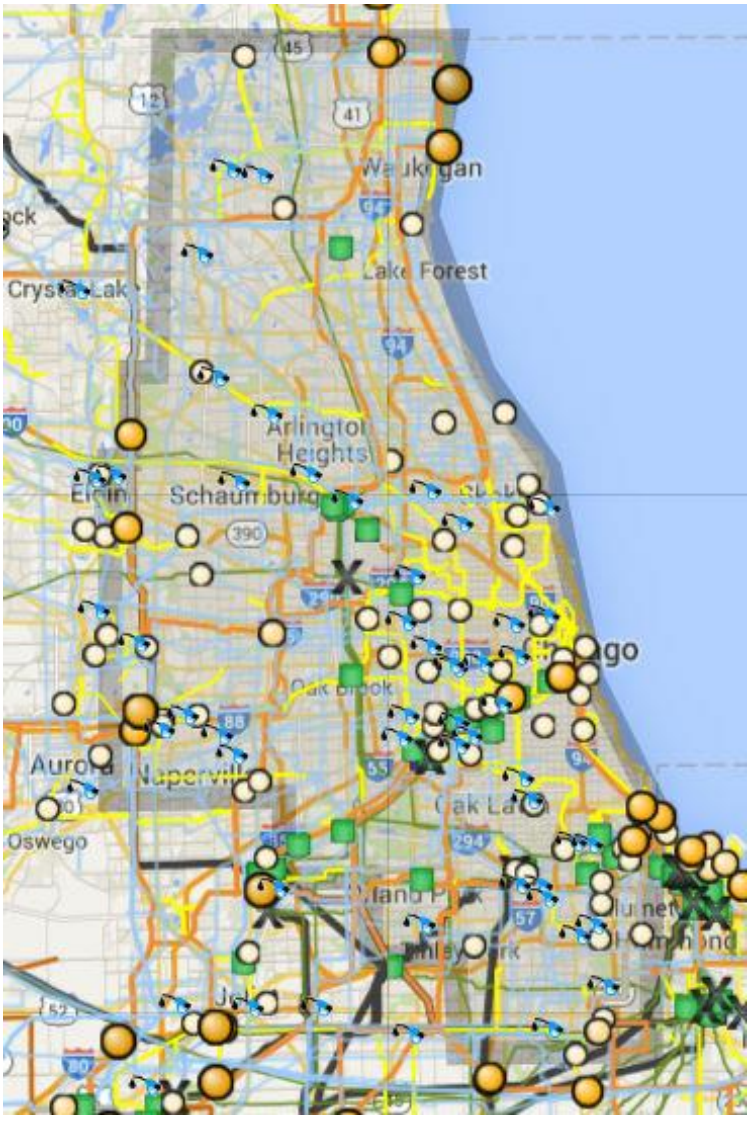
IEMA Region 3 includes the counties that surround the Chicago area (collar counties). Cities in this region include Joliet, Kankakee, and Dekalb. The ExxonMobil Refinery in Joliet operates in this region. Two natural gas pipeline hubs are also in the region near the refinery. Two nuclear electrical generation plants are also in this region, and a number of high powered transmission lines run through the region. Because the region surrounds Chicago, contains a refinery and two natural gas hubs, it has a great number of natural gas and petroleum transport pipelines, Any land-based fuels brought into Chicago (unless from Wisconsin) go through this region. Its natural gas service is from Nicor, and its electrical service is with ComEd. The region is densely populated. It is not at risk for earthquakes, but severe storms in summer and winter and possible terrorist activities are threats.

Figure 16: IEMA Region 3.



IEMA Region 4 includes Chicago's Cook County, along with Lake County to the north and DuPage County to the west. The region's customers are serviced by Nicor Gas, North Shore Gas and Peoples Gas for natural gas and ComEd for electricity. While the region does not have any nuclear facilities or refineries, the large number of residents and high requirements for energy make infrastructure leading into this region critical to protect. A number of natural gas and petroleum pipelines run through the region along with a number of petroleum and natural gas facilities. The region is at risk for winter and summer storms and terrorism.

Figure 17: IEMA Region 4.



IEMA Region 6 is in the west central part of the state. Major cities include Peoria, Quincy, and Springfield. The region is at risk for flooding, as the Illinois and Mississippi rivers confluence here. Ameren Illinois provides electricity and natural gas for the majority of this region although Nicor Gas serves some counties along the Mississippi River, and Springfield electric utility is municipally run. The region has no refineries or nuclear facilities, but like other regions in the state, it has a number of high voltage power lines which run through the region some of which intersect here.

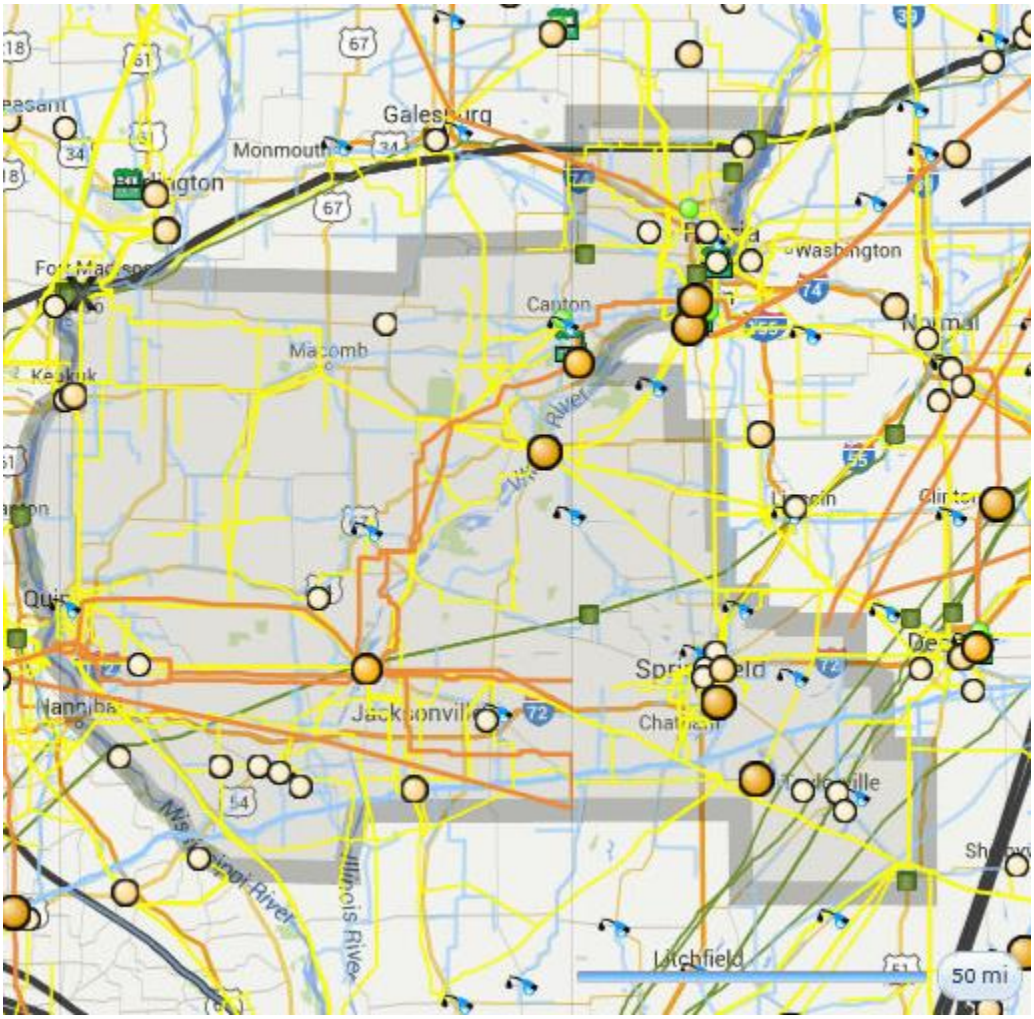


Figure 18: IEMA Region 6.

IEMA Region 7 covers the east central part of the state. Major cities include Bloomington, Champaign, and Decatur. There are no refineries in this region, and 1 nuclear facility at Clinton. The region has several wind farms, and a number of high voltage electrical lines transect the region as well. It is primarily served by Ameren Illinois for electricity and natural gas. The region is not particularly at risk for flooding or earthquakes; the main risk is severe storms. The region is home to the state's only liquefied natural gas production facility in Gibson City.

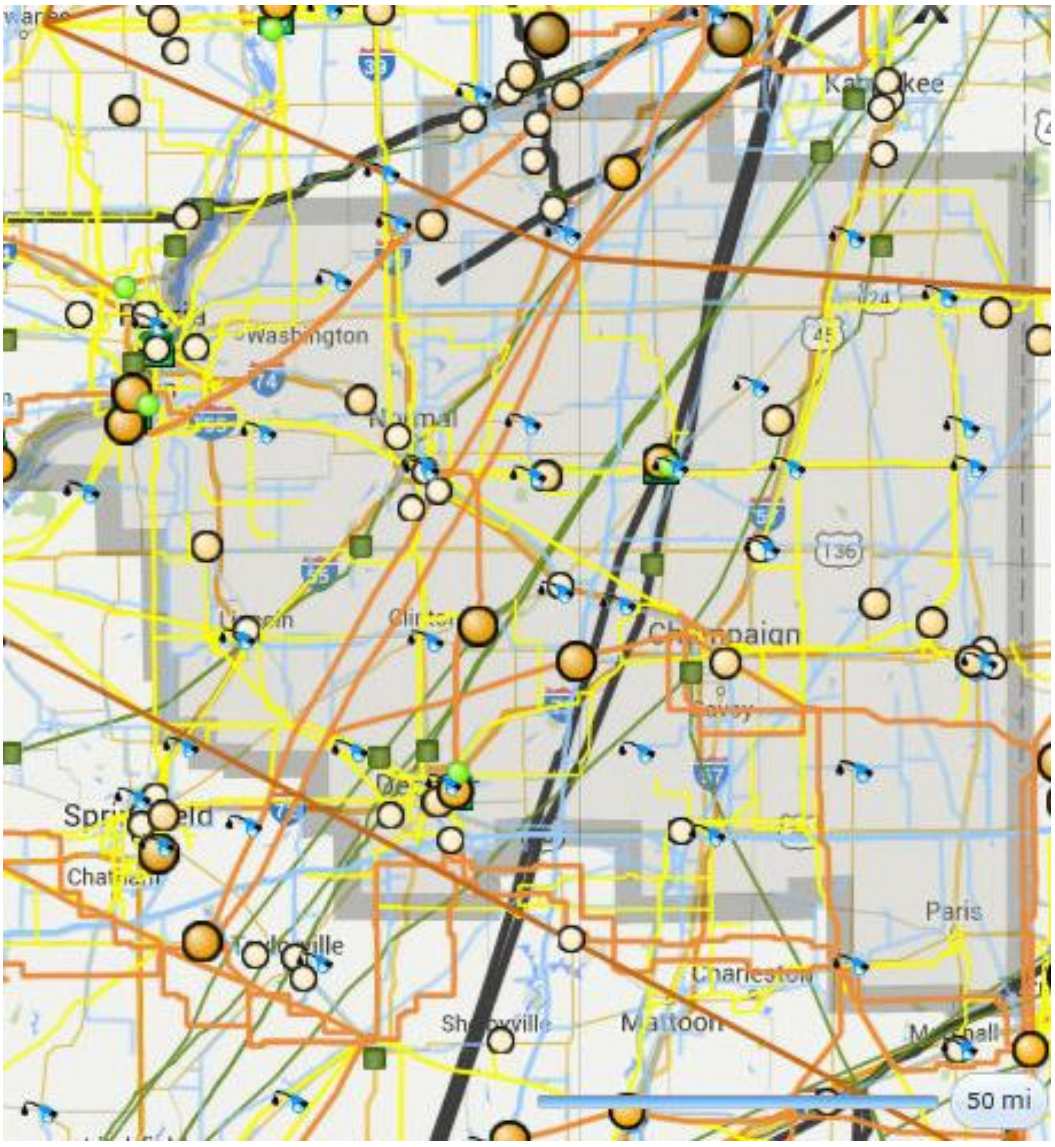


Figure 19: IEMA Region 7.

IEMA Region 8 includes the southwestern part of Illinois surrounding St Louis. A 306,000 bbl/day ConocoPhillips refinery is in the region near Wood River. Several petroleum pipelines converge at this location. There are no nuclear electrical generating facilities or wind farms. The region is vulnerable to flooding and would take impact from a New Madrid earthquake.

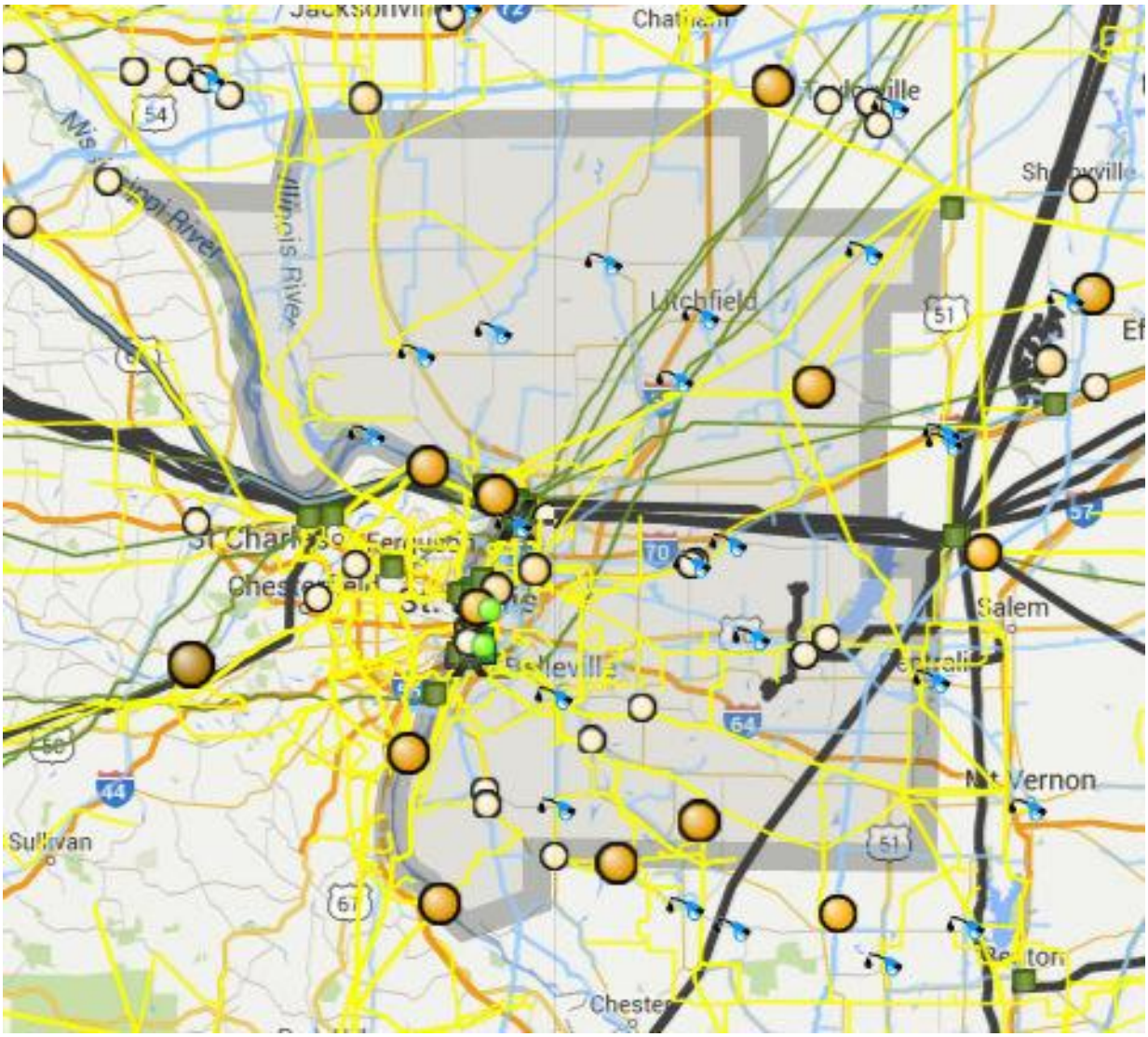


Figure 20: IEMA Region 8.

IEMA Region 9 covers the southeastern part of the state. Major cities include Marion, Charleston, and Effingham. One refinery, owned by Marathon Petroleum Company (215,000 bbl/day) is located in the region near Robinson. A number of petroleum pipelines intersect in this region. The region is home to a major crude oil storage tank farm located near Patoka where several companies hold crude oil. Impacts to this tank farm could significantly impact fuel supply and pricing. There are no nuclear electrical generating facilities or wind farms, but a number of high powered transmission lines run through the northwestern half of the region.

Figure 21: IEMA Region 9.

IEMA Region 11 includes the fifteen counties on the southern end of Illinois. The region does not have refineries, nuclear electrical generating facilities, or wind farms. It is not heavily populated but is the IEMA region most at risk of earthquake. It has had a number of strong storms including tornadoes, ice storms, and strong thunderstorms that many have referred to as inland hurricanes because of the strong winds. A number of large natural gas and petroleum pipelines intersect just south and west of Williamson. If an earthquake was to occur and damage occurred to these pipelines, supply would be reduced significantly.

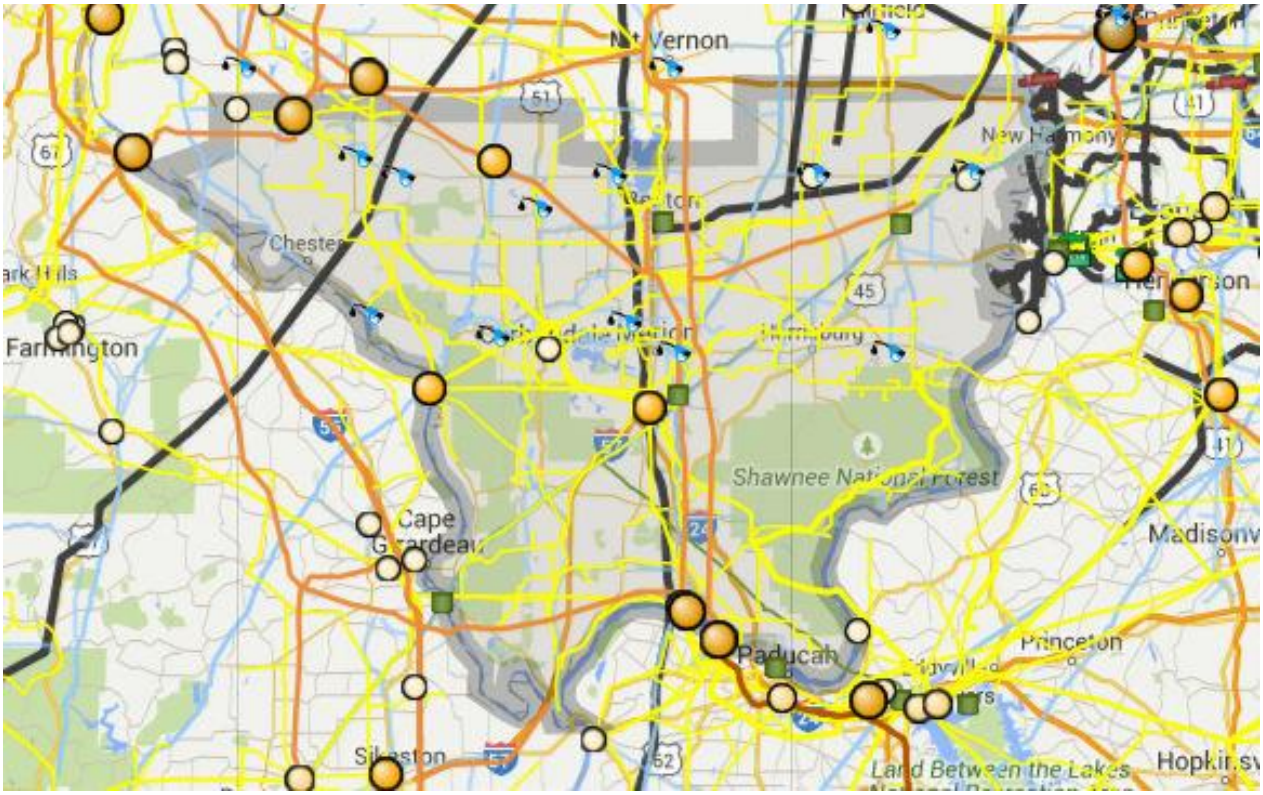


Figure 22: IEMA Region 11.

Section Five. State of Illinois Energy Assurance Geographic Information System

As a component of energy assurance preparedness, the State of Illinois has developed a state-wide energy sector geographic information system (GIS) database for use by state energy assurance personnel in preparation for and response to energy emergencies. The database includes energy infrastructure layers such as electrical lines, natural gas and petroleum product pipelines and energy sector facilities that were purchased from a commercial vendor (MapSearch) after vetting several commercial sources for this information. The database also offers customized data layers generated by the state including locations of state facilities, gas stations, locations with combined heat and power capabilities and bio-fuel facilities. The password-protected database is available online. For access requests, please contact the state Energy Assurance Engineer.

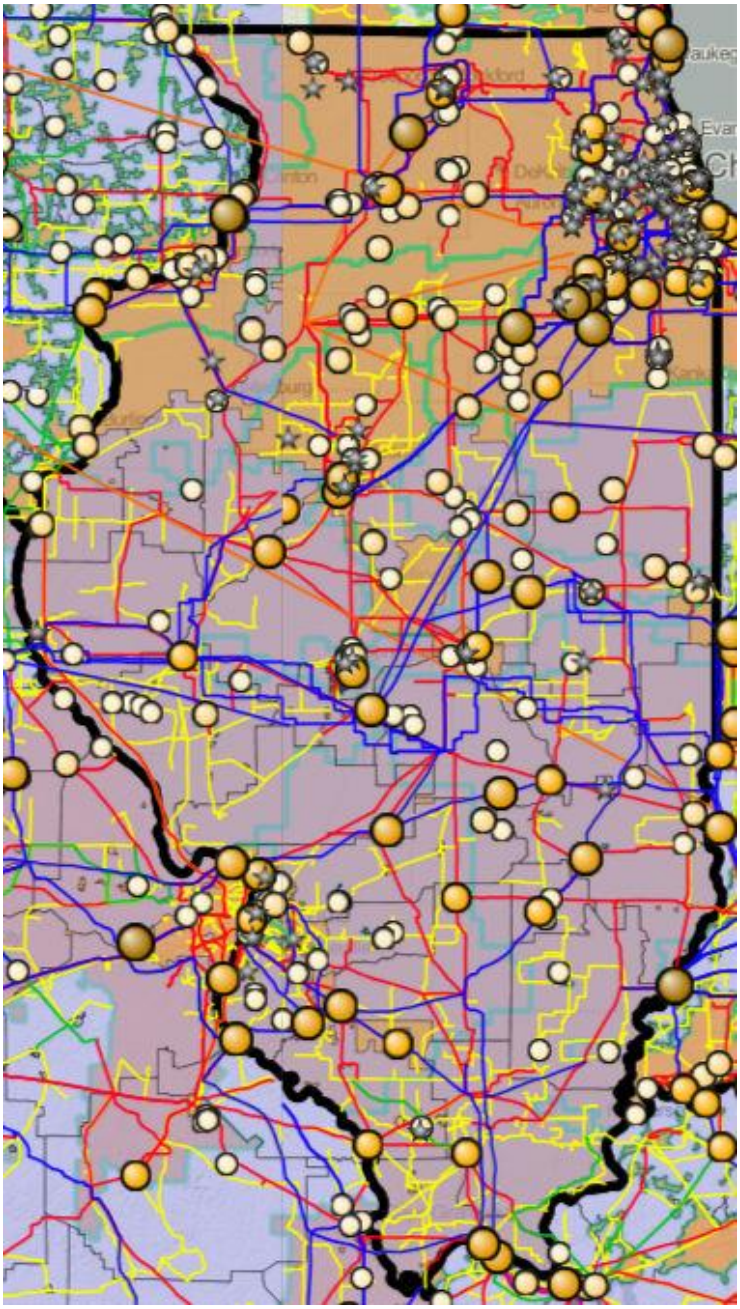
While users can select needed data from across the infrastructure spectrum, the organized maps are categorized into the different state energy sectors (electrical, natural gas and transportation fuels) with different web-based GIS portals dedicated to each. Below is a discussion of the layers available in each and their potential uses for state energy assurance. Information on renewable energy sources such as ethanol or wind turbines are included in their respective energy sectors (i.e. transportation fuels for ethanol and electric for wind turbines).

Electrical

The State of Illinois energy assurance GIS portal for the electrical sector includes two primary types of layers; 1) electrical infrastructure, and 2) restoration priorities The primary electrical infrastructure data layers include a) transmission power lines (which include information on owner/operator, voltage etc.), b) power plants (generating capacity, owner/operator, primary fuel source etc.), c) utility, municipal utility and rural cooperative territories and d) substations. The primary restoration priority layers include layers that show the location, tenants and purpose of all state owned or leased buildings, hospital, schools, and police and fire departments.

Outside of the GIS portal the EAE has the ability to monitor potential and ongoing energy emergencies. The primary monitoring tools include a) a map showing the number of outages by county as reported by ComEd and Ameren b) a weather radar for tracking storm movements and intensity (courtesy of the National Weather Service) and c) issued weather watches and warnings. Using the three data sources in unison, the state can monitor for weather related disasters, determine where current electrical outages are occurring and be aware of what important infrastructure layers (transmission lines, power plants) and facilities may be in the line of a weather event.

Figure 23: State of Illinois Electrical Sector Energy Assurance GIS Database.

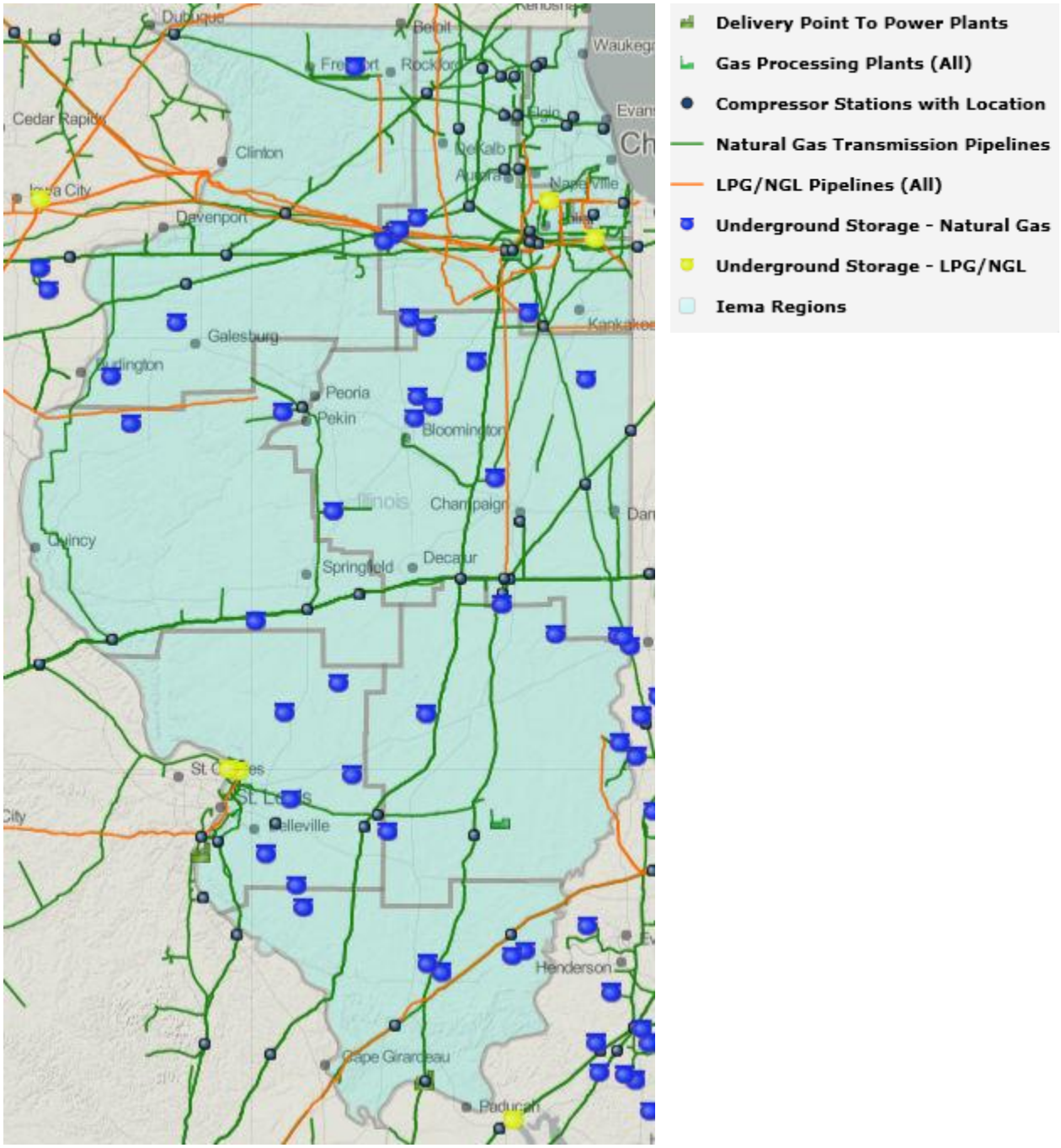


Natural Gas

The GIS portal includes layers for various pipelines including ownership and diameter; facilities that include processing plants, compressor stations and delivery points; underground storage facilities; and, interconnection. Figure 24 is a screenshot of the natural gas GIS portal. The green lines on the map are natural gas pipelines and the orange lines on the map are LPG/NGL

pipelines. The energy assurance team can use the map to determine potential damage to above-ground natural gas infrastructure (facilities, interconnects) in the case of a weather event or potential below ground damage to pipelines in the case of uprooted trees from a storm or an earthquake. While this map only contains natural gas transmission pipelines (ones that transmit gas between facilities) the GIS database also has access to distribution lines. However, the state feels that distribution lines that deliver gas to residents and businesses will be handled by utilities and municipalities, and the need for the state to become involved (driver hour waivers, equipment, etc.) would only occur if there was damage to the transmission pipelines.

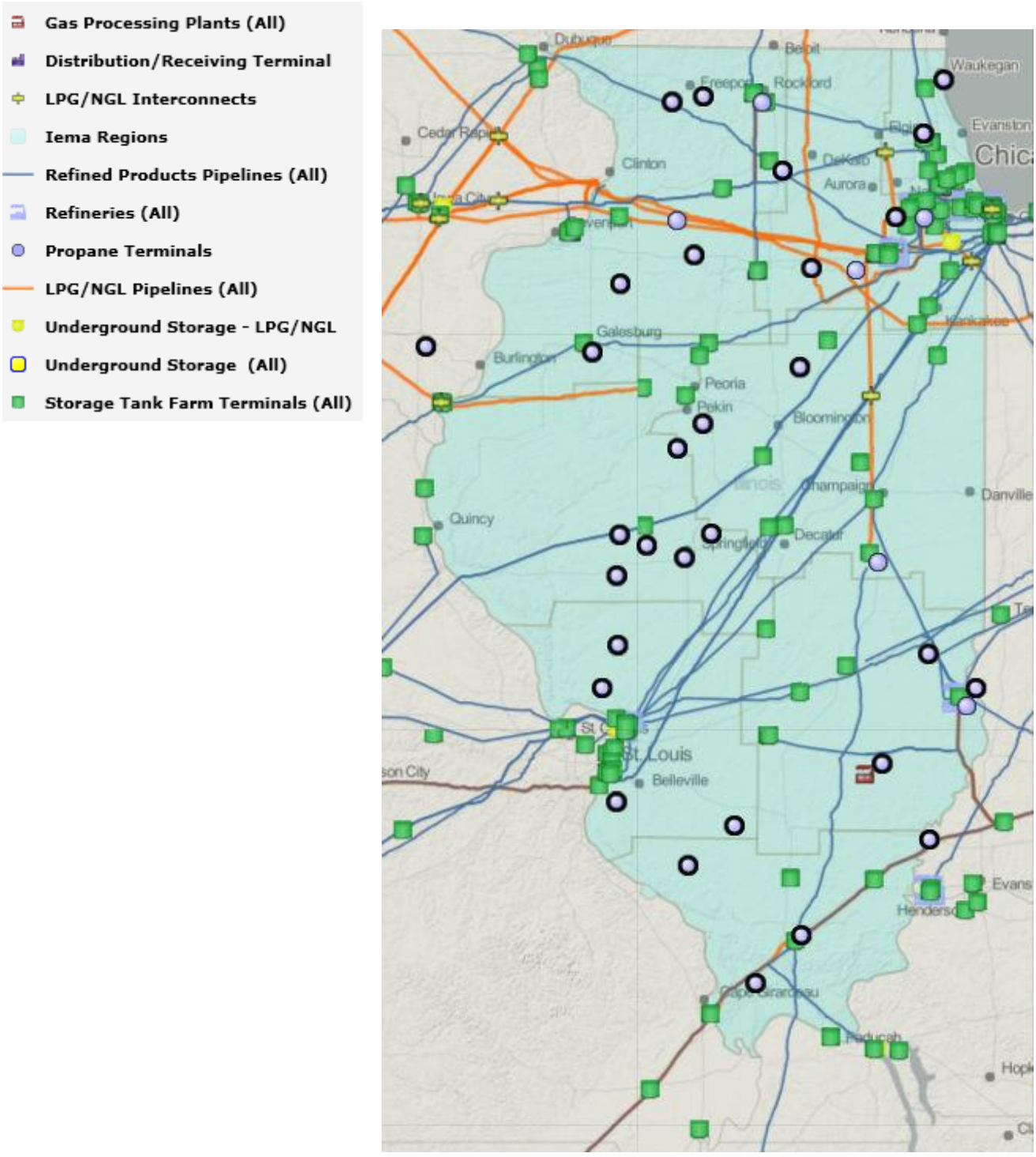
Figure 24: State of Illinois Electrical Sector Energy Assurance GIS Database for the Natural Gas Infrastructure.



Transportation fuels (petroleum)

The transportation fuel network in Illinois is dominated by the movement, refining, distribution and sales of petroleum products. The State of Illinois energy assurance GIS database includes data for the movement (pipeline, interconnections and pumping stations), refining (refineries), distribution (pipelines and terminals) and sales (gas stations including specific information on stations that offer alternative fuels (E85, LNG, Bio-diesel). There is work under way to determine which stations have backup power and reach out to those stations that do not. The information contained in the transportation fuels database can be used by the state to study the flow and potential disruptions to petroleum through pipelines, determine the locations of terminals that may be able to offer fuel to emergency vehicles, the location of gas stations that may also be able to offer fuel and alternative fuel and to map possible damage to refineries, pipelines and other facilities from disasters.

Figure 25: State of Illinois Electrical Sector Energy Assurance GIS Database for Transportation Fuels.



Acronyms

CMS- Illinois Central Management Services

ComEd- Commonwealth Edison

EAE- State of Illinois Energy Assurance Engineer

EOP- Emergency Operation Plan

ERC- Emergency Response Center

FEMA- Federal Emergency Management Agency

ICC- Illinois Commerce Commission

IDOC- Illinois Department of Corrections

IDOT- Illinois Department of Transportation

IERG- Illinois Energy Reference Guide

IECA- Illinois Electrical Cooperatives Association

IEMA- Illinois Emergency Management Agency

IEOP- Illinois Emergency Operations Manual

IHCHMP- Illinois Human-Caused Hazard Mitigation Plan

IMUA- Illinois Municipal Utilities Association

INHMP- Illinois Natural Hazard Mitigation Plan

ISA- Infrastructure Security Awareness

ITHMP- Illinois Technological Hazards Mitigation Plan

ITTF- Illinois Terrorism Task Force

MAR2N- Mutual Aid Response and Resource Network

NERC- North American Electric Reliability Corporation

PHMSA- Pipeline Hazardous Materials Safety Administration

RFC- Reliability First Corporation

SEO- State Energy Office

SEOC- State Emergency Operations Center

SERC South East Reliability Corporation

SIRC- State Incident Response Center

UAC- Unified Area Command

Appendices

Appendix 1. State of Illinois Energy Supply Disruption Tracking Process

State of Illinois

Energy Supply Disruption Tracking Process

Illinois Department of Commerce & Economic Opportunity

State Energy Office

August 2010

Updated June 2015

State of Illinois Energy Supply Disruption and Response Tracking Process Plan

I. Introduction and Overview:

As a component of the *State of Illinois Energy Reference Guide*, the following document outlines a process for tracking the duration, response, restoration, and recovery time of energy supply disruption events (Supply Disruption Tracking Process (SDTP)). The document will serve as an introduction to the more encompassing *State of Illinois Energy Reference Guide* by indicating the data used and people responsible for the decisions required for successful energy assurance at the state level. Effective tracking of the state's energy supply and potential disruptions will require participation by a number of state and local agencies as well as the private sector, and a thorough understanding of the state's energy requirements, uses, supplies, demand and potential disruptions, along with the severity and recovery time from those disruptions. Illinois has its own unique energy profile with a mix of nuclear and coal powered electricity and a growing ethanol industry which require a unique plan for tracking potential disruptions and remediation efforts for energy restoration.

This document will outline a proposed supply and disruption tracking process understanding that the process will evolve and change over time as the Energy Reference Guide is defined and implemented, and state agencies and private entities identify their roles. It should be understood that all sources of information, responsible parties and other Energy Reference Guide components will not be documented here, only the proposed methods to develop this information. The actual information and plan to execute will be covered in the state's Energy Reference Guide which will grow, in part, from this document. However, this document will attempt to define the method proposed to track disruptions and will also identify potential gaps that currently exist either in data, personnel, the knowledge base or within the state agencies to meet all the requirements to thoroughly map and track energy disruptions to the state of Illinois, and will define the required communication to ensure disruptions are discovered, restored and communicated to policy makers and the public in the most efficient, accurate and timely manner.

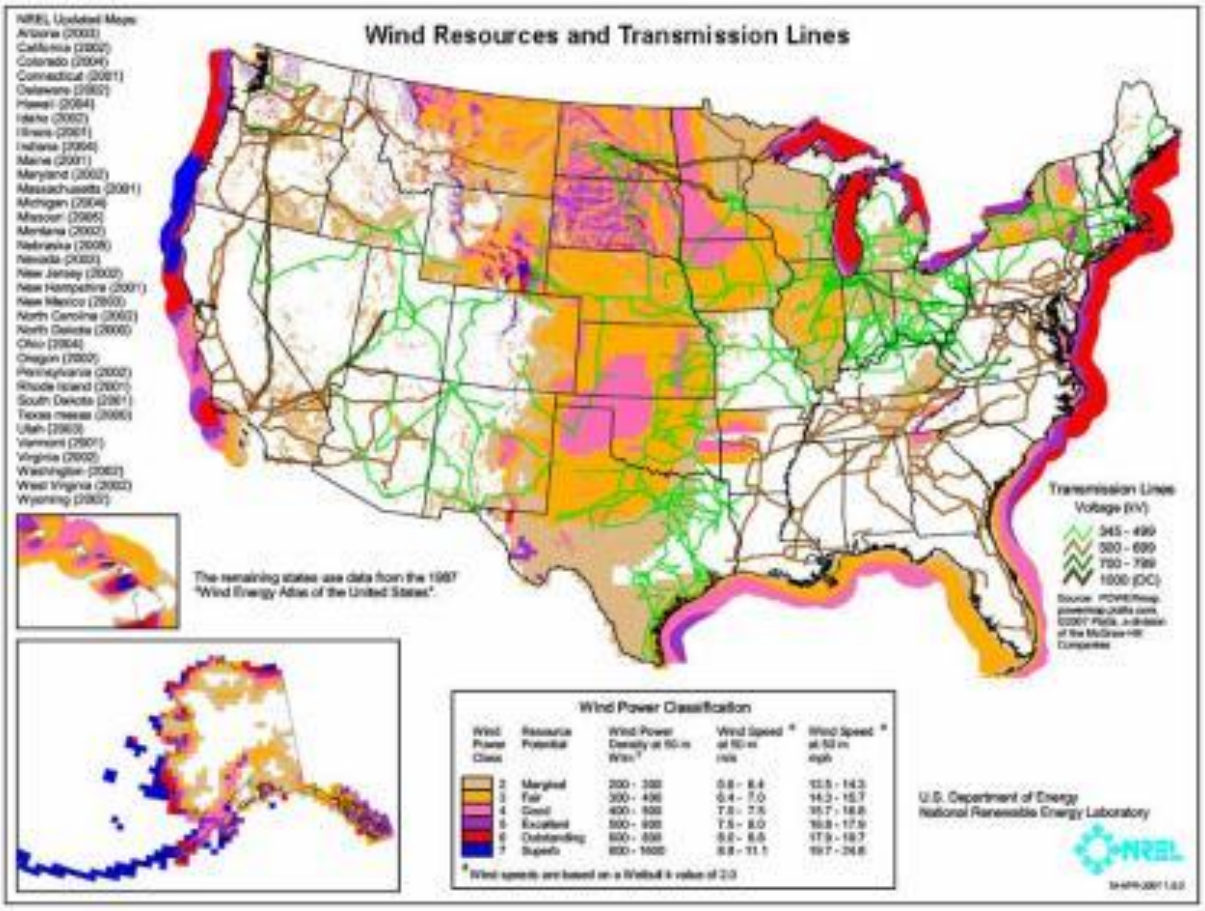
We propose four steps to developing the disruption tracking and restoration process. These include: 1) defining the state's current energy sources, supply and demand; 2) defining and understanding the state's infrastructure for delivery to users; 3) understanding and cataloging potential disruptions to the state's energy supply along with the risk of these disruptions occurring and the potential damage to supply from each; and 4) developing a management plan for the discovery, reporting, communication and restoration of energy disruptions within the state.

II. Energy Portfolio of Illinois

The first step in the process for tracking energy supply disruptions is defining the energy profile of the State of Illinois. In other words, identifying the forms of energy that are currently used and examining the state's future energy sources, the projected demand for this energy, defining the supply of these sources, (current and future), and the infrastructure for transporting that energy.

This assessment will be performed using available literature and statistics such as those available from the Illinois Commerce Commission (ICC), the U.S Department of Energy's (DOE) Energy Information Administration's (EIA) Statistics and the US Environmental Protection Agency's Emissions and Generation Resource Integrated Database (eGRID) for example. It's understood that the primary sources of energy for Illinois, like most states, include petroleum for transportation, natural gas for heating and coal and nuclear power for electricity. However, Illinois also has the capacity to generate wind energy (Figure 1) and is generating large amounts of ethanol from home-grown corn. A complete energy profile will examine all current and potential energy uses including future renewable energy production. In addition to the energy profile, the report should indicate the available supply of the materials required to produce this energy (petroleum, natural gas or coal for example), typically reported in days of supply, which will be critical to understanding the effect a disruption would have on the energy available to affected areas and will identify the infrastructure (pipelines, refineries, transmission lines etc.) required to transport the energy to needed locations.

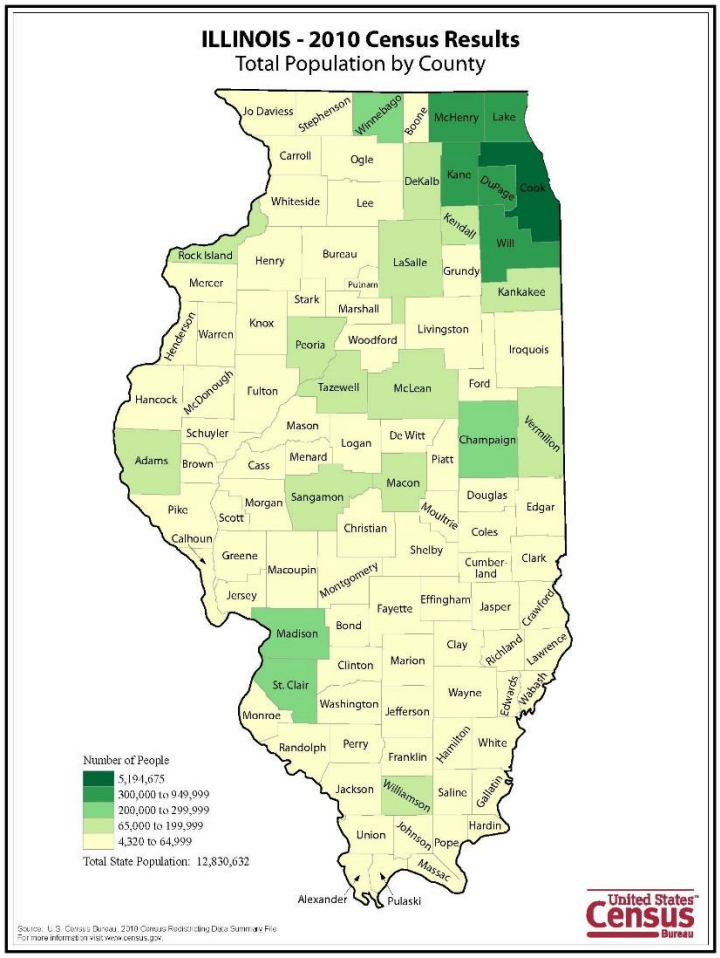
Figure 1. Wind Energy Potential (for electricity generation) for States in the US indicates Illinois has Fair Locations Along Major Transmission Lines



The second step in the development of a tracking plan for supply disruptions is to catalog the infrastructure associated with these energy sources. Where is energy produced in the state, where does energy and/or raw materials required to produce the energy enter the state, where in the state is it transported and how and where is it finally used? Much of this information can be found using geographic information system (GIS) layers from multiple sources including from private sector participants such as electrical companies, natural gas companies and petroleum companies and information from federal and state agencies. The Energy Assurance Engineer currently uses Envision MapSearch, along with other platforms previously mentioned, as the GIS platform to track energy infrastructure in the state. These systems display much of the state's energy infrastructure in a geo-spatial format similar to a map and can model potential disruptions.

Along with an understanding of the infrastructure, the system should account for the demographics of the state. Locations with a large population and/or large industrial base are obviously going to require more energy. Rural farming communities, predominant in Illinois, have different energy profiles than large cities such as requirements for large amounts of natural gas during the fall for drying corn, but much lower energy demand during most of the year. Areas with growing populations could be taxing the energy infrastructure in their area. Much of this information is going to be intuitive based on the existing infrastructure, but including this information, which will be available from the US Census Bureau and other sources, most likely in map format, when making decisions on disruption impacts, could assist the state in understanding the severity of the disruption on population and the economy (Figure 2).

Figure 2. Illinois Population Map shows population densities in the northeast (Chicago), central and southwest (St Louis suburbs) sections of the state.



Overall Energy Portfolio

Cataloging energy sources and supplies in the state of Illinois is going to begin with identifying the private companies that provide these services to the state. The ICC has this information available for the electricity, natural gas and petroleum industries. Once all of the energy providers for the state of Illinois have been identified, each will be contacted and asked to contribute information they have on their historical, current and projected supplies for their given energy source. The ICC will be contacted for information on these sources. Good communication with the private industry providers of energy to the state is critical to the success of tracking energy and disruptions.

To understand and quantify energy supply, there are some general publications available that identify supplies for multiple energy sources including the Energy Assurance Daily which is a publication of the EIA that discusses major developments in the electricity, petroleum and natural gas industries which could reduce supply. The EIA also puts out information on total energy use including annual energy consumption by source for each state. Table one indicates the energy sources and total British thermal units (Btu) for Illinois in 2012. Twenty four percent of the total energy used in Illinois was from nuclear generated electricity versus the national average of 8.5%. This could be a critical difference in Illinois' energy portfolio which needs to be taken into account when considering energy assurance and potential disruptions. Below is summary of information for these major energy sources for Illinois.

Table 10 2012 Illinois Energy Use In Trillions Of Btu (source: US DOEEIA)

State	Total Energy	Coal	Natural Gas	Petroleum	Nuclear	Renewable	Interstate Elec. Flow
Tril. Btu	4,293	969	939	1,154	1,010	219	-446
%	100%	23%	22%	27%	24%	5%	-10%

As mentioned, much of the information regarding infrastructure is available using multiple GIS applications. The EAE is currently using Envision's MapSearch platform to display and track hundreds of infrastructure data layers that can be viewed in a geospatial (map) format online. The Department of Homeland Security's iCAV system provides information on population densities and weather which can be viewed to estimate potential impact of weather events on given infrastructure and population densities, and can have customized input that can be distributed to users. The Illinois Commerce Comission also publishes an annual report listing electric and natural gas utilities by geographic area in Illinois. An overview of Illinois' energy strengths and weaknesses would indicate the state is a major transportation, distribution and oil refining location and produces a good deal of electricity but also imports much of the sources for energy production (Table 2).

Table 2. Strengths and Weaknesses of Illinois Energy Supplies

Strengths	Weaknesses
Petroleum	
* Leads the Midwest in refining capacity numerous pipelines run through and terminate in state * 4 in-state refineries * Oil coming from Canada and Gulf Coast to IL refineries	* Most of state's petroleum is imported making state vulnerable to supply disruptions * Any disruption in down-stream pipelines impacts Illinois production
Electricity	
* Top nuclear electricity producing state in US * 3rd largest coal reserves in US * Leading producer and net exporter of electricity	* Top energy consuming state due to industry * Most of state's coal inaccessible and high in sulfur * Strong reliance on coal and nuclear (Over 95%)
Natural Gas	
* Major transportation hub for natural gas * Numerous pipelines run and end in state	* Most natural gas used by state is imported * Any disruption in down-stream pipelines impacts Illinois production
Renewable	
* Top producer of corn-based ethanol * Potential for wind and solar contributions	* Little potential for hydro-electric development * Estimated renewable capacity will not meet state demand

Petroleum

Being so closely associated with the price of gasoline, petroleum prices and supply are closely monitored and discussed on a daily basis by major media outlets. Price per barrel is often listed on news programs, and changes in the price of gasoline are commonly listed on websites such as gasbuddy.com. Sudden increases in the price of gasoline may be a sign that oil supplies have gone down or the potential for disruption exists as this market reacts quickly. Illinois has four

petroleum refineries, two of which are in the Chicago area and leads the Midwest in refining petroleum into products (gasoline, diesel, propane, heating oil). The state had an oil reserve of 42 million barrels in 2013. This amount varies by year and should be monitored.

The EIA has data on many different components of petroleum supply, sales and sources including a petroleum status report, pricing reports for gasoline, diesel, heating oil and propane and an import report. The EIA publishes a report on first sales of petroleum products directly into states which could be useful in calibrating new supplies of petroleum coming directly to the state. The EIA also publishes a report on petroleum wholesale and retail prices at the state level. Petroleum inventory and production is monitored and reported by EIA at the state and regional level. All of these reports may be used to monitor current supply and use, and predict changes in supply and pricing which could be indicative of supply or future shortages. The American Petroleum Institute provides a number of sources of information regarding petroleum supplies, gasoline prices and imports. Data purchased from the Oil Price Information Service (OPIS) further provides information regarding petroleum pricing, supply and future constraints.

Of course, as in the case with other energy supplies, contact with industry is essential. Existing industry contacts will be gathered from current state employees such as those with the ICC and will be logged within the Illinois tracking database. These companies will be contacted as part of the Energy Reference Guide and asked for methods they use and may be willing to share to monitor use, supply, demand and trends.

Understanding the effects of weather on heating oil and propane sales and prices, and understanding peak gasoline use periods can also help when monitoring demand for petroleum products. Long cold spells may lower heating oil supplies and peak summer vacation and holiday travel periods may lower gasoline supplies. Also, during certain times of year, gas blends are changed. This can impact supply and pricing and needs to be understood. When combined with a disruption, the effect from these situations on energy assurance will be more extreme. Illinois currently participates in EIA's State heating Oil and Propane Pricing Program (SHOPP). This program monitors retail propane prices and supply across the state in order to proactively detect any potential disruption.

The EIA publishes a list of operable refineries which can be used to determine where oil is being converted to gasoline, diesel, propane and heating oil. Oil pipeline information is available from MapSearch (Figure 3). Illinois is a major transportation hub for crude oil. Several crude oil pipelines terminate in Illinois making this a point of concern for disruptions to petroleum supplies not only in Illinois but surrounding states.

Figure 3. Envision Mapsearch Screen Capture of Oil and Gas Infrastructure in and around Chicago, IL

Natural Gas

The natural gas market has been more difficult to monitor than petroleum. However, there are some tools available that can be helpful. The EIA publishes a monthly report on natural gas inventories and deliveries to industrial, commercial and residential customers, withdrawals from underground storage and pricing. This information is compared to previous years and 4-month averages and can be used to identify trends in price and use. Also, according to the National Association of State Energy Officials (NASEO) Energy Assurance Guidelines, two other indicators of changes in natural gas supply are spot and contract prices and curtailment notices. Efforts will be made to obtain information on each of these as well from the state's natural gas providers. Eighty percent of the state's households rely on natural gas for home heating. This is the primary use of natural gas in Illinois. Weather will also need to be watched. Long-term cold spells may reduce supplies. To meet peak demand in the winter, the state stores natural gas in

natural aquifers and depleted oil and natural gas reservoirs, but a disruption in a pipeline or accidental release of this gas could cause a shortage.

The ICC publishes an annual report that lists the natural gas providers in the state (9 as of 2014), breaks it out by region and lists costs to consumers. Contacts will be made with the natural gas industry personnel for each of these 11 companies to determine if they are acquiring and can share information on supplies and in-state demand.

The previously mentioned ICC report offers information on companies that distribute and sell natural gas by region in the state. Natural gas pipelines, similar to petroleum pipelines are also available from MapSearch. Similar to petroleum, Illinois is a major transportation hub for natural gas. Several natural gas pipeline systems converge at Chicago including systems from the Gulf Coast, western Canada and just starting in 2009, a pipeline from Colorado and Wyoming.

Electricity

Ameren and ComEd are the primary providers of electrical energy in Illinois with MidAmerican and Mount Carmel providing small supplies. Each company will be contacted and information requested regarding their energy sources and supply of these sources. However, many federal government sources of information are also available for electricity. All electrical sales are reported to the EIA including sales of electricity generated from renewable energy at the state level for biomass, wind, geothermal and solar by state. The site also gives information on sources for electricity generation by state which will allow the tracking of the use of specific sources such as coal and natural gas, and the monitoring for reduced supplies of these raw materials for electrical generation, according to the site. Coal and nuclear fuels account for 86% of the state's electricity generation. Also published by the EIA is a quarterly coal price and inventory report which will allow monitoring of coal supplies, availability and use including the number of in-state days of supply. Illinois has large coal reserves, but the coal is high in sulfur and must be mixed with low sulfur coal from the western US (primarily Wyoming) before combustion to meet regulations.

Other data provided by EIA for electricity supply includes an annual inventory of power plants in the United States which has been discontinued but contains historical data on electrical generation by state and by energy source for gas, coal, petroleum and hydroelectric.

The USEPA's Emissions and Generation Resource Integrated Database (eGRID) also produces a database which contains all electricity generating plants, their net generation of energy by source by year (coal, nuclear, biomass etc.), and the plant's location including latitude and longitude

coordinates which will allow for input into a geographic information system for mapping purposes.

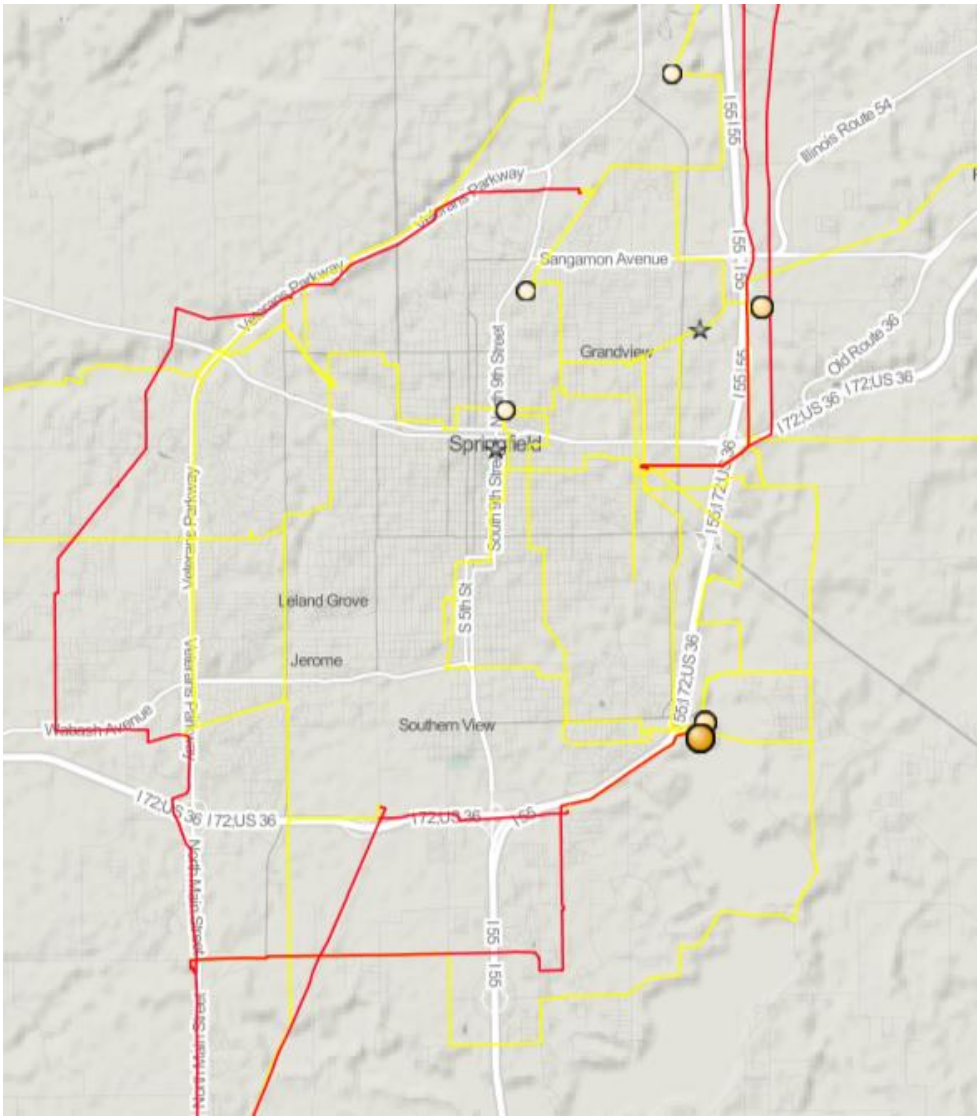
Other useful information for tracking potential demand for electricity includes weather information, which is available online from a number of sources. Temperature and long term forecasts of elevated summer or cold winter temperatures may indicate increases in demand.

Specific to Illinois, the ICC publishes reports on electrical sales by year broken out by company, price and user (retailer, commercial, public etc.) for the state. The data is broken out by region and could give insight into use and demand by region.

Because such a high percentage of Illinois' electrical energy is produced using nuclear power, this will require special attention. The source for nuclear power generation is not expected to be an issue nor price for this source, but other factors, such as reactor failure or terrorism need to be considered. Illinois has six nuclear facilities with eleven reactors.

The location of power plants and their energy sources in the state of Illinois is available from the USEPA's eGRID website including latitude and longitude information for entry into a geographic information system. Transmission lines, power stations and other electrical grid information are available for viewing through the Energy Assurance GIS database (Figure 4).

Figure 4. Envision Mapsearch Screen Capture of Electrical Infrastructure for Springfield, Illinois



Renewable Energy

The two primary components of Illinois' renewable energy portfolio are electricity from wind and solar and bio-fuels for transportation from ethanol (primarily from corn) and bio-diesel (primarily from soybeans). EIA reports minimal use of hydro-electricity in Illinois. Table 1 indicated that in 2012, just over 5% of the state's total energy was provided by renewable sources for electricity, and that the state's renewable electric generation capacity was 2,112 megawatts. Illinois' renewable energy standard requires the state's utilities to be producing 25%

of their electricity from renewable sources by 2025. Much of this is expected to come from wind.

Illinois being a large corn and soybean production state (often first or second in production nationally) makes it a good location for the production of corn ethanol and soy bio-diesel. As of 2012, ethanol production in Illinois was greater than 1.27 billion gallons per year (Figure 5). Plants often keep ethanol in storage at the facility. The Governor of Illinois has the authority to suspend the blend wall in times of emergency (allowing for more ethanol to be used in replacement of gasoline for fuel). This could make ethanol a viable alternative to gasoline in times of emergency if supply is cut off.

Figure 5. Ethanol production by state in 2012.

Rank	State	Thousand Barrels	Rank	State	Thousand Barrels
1	Iowa	82,645	15	California	4,216
2	Nebraska	43,420	16	New York	3,795
3	Illinois	30,323	17	Colorado	2,893
4	Minnesota	25,214	18	Pennsylvania	2,546
5	South Dakota	23,481	19	Georgia	1,745
6	Indiana	22,390	20	Idaho	1,180
7	Wisconsin	11,663	21	Mississippi	1,041
8	Ohio	10,425	22	Arizona	955
9	Kansas	10,124	23	Oregon	949
10	North Dakota	8,655	24	Kentucky	819
11	Texas	8,061	25	New Mexico	579
12	Michigan	6,202	26	Wyoming	266
13	Missouri	5,886	27	Louisiana	35
14	Tennessee	5,207			

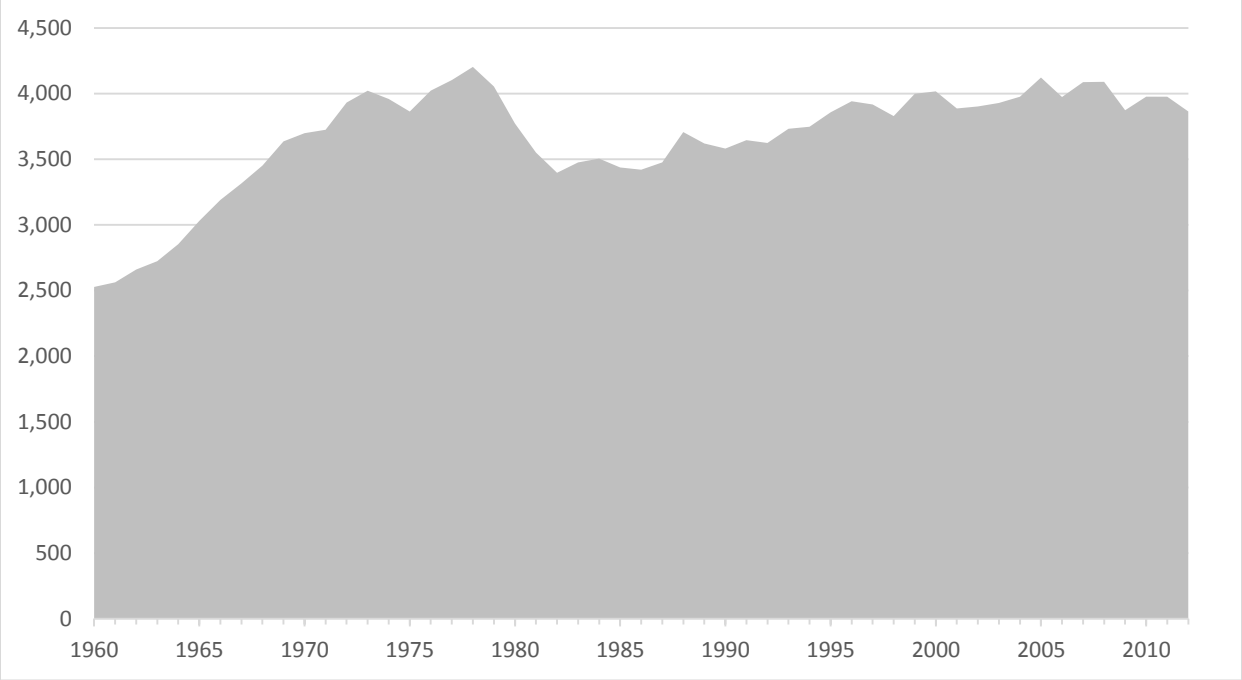
The site, www.windpoweringamerica.gov offers information on potential wind power generation in Illinois. This site estimates close to 250,000 megawatts of electricity could be generated from wind energy in Illinois. The American Wind Energy Association shows current wind projects by state, county and even by project with megawatt potential for each project.

Summary

A summary of Illinois' energy sources, infrastructure, supply and demand shows an increasing use of all energy sources since 1960 (Figure 6). With a diverse energy portfolio, including electricity generated from in-state sources of coal and nuclear energy, together with renewable energy from ethanol and bio-diesel and the potential for wind generation, Illinois has the potential to generate a good deal of, but not entirely all of the in-state energy supplies.

Therefore, energy is going to be required from out of state and non-renewable sources which are anticipated to be in shorter supply. The state has an advantageous infrastructure, however, being one of the largest electricity generating states in the country with a typical surplus, and several natural gas and oil pipelines run through and terminate in Illinois, especially in Chicago with two oil refineries and a large natural gas hub. However, these same advantages increase the likelihood that a disruption of energy in Illinois could have effects not only in the state but potentially several other states as well increasing the importance of energy supply and disruption tracking in Illinois.

Figure 6. Energy consumption (trillions of BTU) in Illinois from 1960 to 2012 shows an increasing trend.



III. Energy Supply Disruptions

Along with understanding the state's energy profile, and the infrastructure required to support this energy use, a complete catalog of potential disruptions to this energy supply needs to be thoroughly documented. Understanding the multiple types of disruptions is critical to understanding how to prepare for them. Also, understanding the severity of each of these impacts is critical. Smaller scale power outages from storms can be corrected by private utilities and small price changes can be adjusted for, but large scale disruptions are going to require state assistance in a number of ways.

Identification of historical interruptions in energy supply is a start for understanding future disruptions. This information should be available from a number of federal and state sources. Private companies who have in the past or currently provide energy to the state of Illinois will also be contacted and sources for this information requested. An additional question to answer will be if these disruptions could occur or are as likely to occur with the current infrastructure. A 1939 power outage may be less likely to occur with the current electrical infrastructure. In addition, the process should include the cataloging of potential future disasters which may not have a historical basis such as terrorist attacks, cyber-threats and huge energy price hikes. Sources available from the Department of Homeland Security and other security agencies may be valuable for determining types and likelihood of future energy disruptions.

Once the severity and frequency of historical disruptions and the potential for future disruptions are cataloged, a database of disruptions (Addendum 2) will be developed and additional information regarding state agency and private entities responsible for response and contacts within these organizations, severity and historical time to repair from similar disruptions (if available). One source for disasters that may impact energy infrastructure is the Department of Homeland Security's (DHS) Federal Disaster Declarations page which lists previous federally declared disasters by state and effected counties. This site also includes information on types of potential disasters. The DHS also publishes a daily infrastructure report which lists any new changes to national infrastructure.

Petroleum

The source and volumes of crude oil supply used by regional refineries may be found in the EIA Petroleum Supply Monthly. This information is needed to estimate the extent to which refiners may need to shift supplies if any given source of crude oil is disrupted.

Natural Gas

The US Government Accountability Office published a report which outlines potential natural gas disruptions and their effect. Disruptions can occur from damage to a pipeline but also from price changes and higher demand. The EIA reports on weekly natural gas storage figures as well as market prices. This information will be monitored to detect for a possible supply disruption.

Electricity

Ameren and Commonwealth Edison, the two major electrical utilities providers for Illinois offer outage information on their websites including a map that shows specific locations for outages. The Electric Emergency Incident and Disturbance Report provides information on electric emergency incidents and disturbances. The Department of Energy uses the information to fulfill

its overall national security and other energy emergency management responsibilities, as well as for analytical purposes. The US DOE's Office of Electricity Delivery and Energy Reliability has a number if publications on their website that discuss emergency situations, emergency preparedness and emergency response which could be useful in developing information on previous and proposed disruptions. Unlike other sources of energy, electricity cannot be stored, it must be used upon generation. However, raw materials such as coal can be stored. Disruptions in coal delivery from railroad or barge issues could reduce the generation of electricity or move generation to more expensive sources such as natural gas.

Renewable Energy

Significant weather events may destroy solar panels, or power lines connecting renewable energy sources such as windmills or the windmills themselves. Feasibility studies have been performed on the equipment, but extreme weather events will impact these structures and should not be ruled out. Weather data should be monitored, potentially even automated for conditions with potential for destruction of wind mills or solar panels. Also, to a lesser extent, long periods of low winds or cloud cover may affect the amount of energy available from these sources. If the state begins to rely more heavily on these sources for electricity generation, these disruptions in supply need to be considered. Likewise, reductions in corn yield or soybean production from off-weather years could reduce the supply of ethanol and bio-diesel. Sites that predict corn and soybean yield need to be monitored such as the USDA's National Agricultural Statistics Service.

Risk Assessment

Once a comprehensive list of historical and potential disruptions has been developed, a risk assessment will be developed for each disruption scenario. A weighted scale will be applied with a score for each possible negative outcome that could result from the disruption. Industry input will be solicited. Disruptions will be categorized from low impact and low risk to high impact and high risk (Figure 7). Based on a consensus by the various state agencies involved in the energy assurance decision making process, levels of risk and corresponding activities will be established. A decision on when the state will become involved will be made and documented in a Supply Disruption Tracking Database. Considerations for impact will include population affected, potential length of disruption, effect on industry and the economy and impact to state security. Considerations for risk include determining the likelihood of the event based on prevention measures in place, replacement sources and previous occurrences of the event. For instance, a loss of electricity to 5,000 people after a thunderstorm would be high risk but low impact so the state would most likely not be involved. However, a power outage involving multiple cities would most likely require action by state and local government. Guidelines will

be established and published online and in pamphlet form for use by all involved parties identifying potential disruptions, the proposed risk and impact of these disruptions and when, potentially the state would become involved.

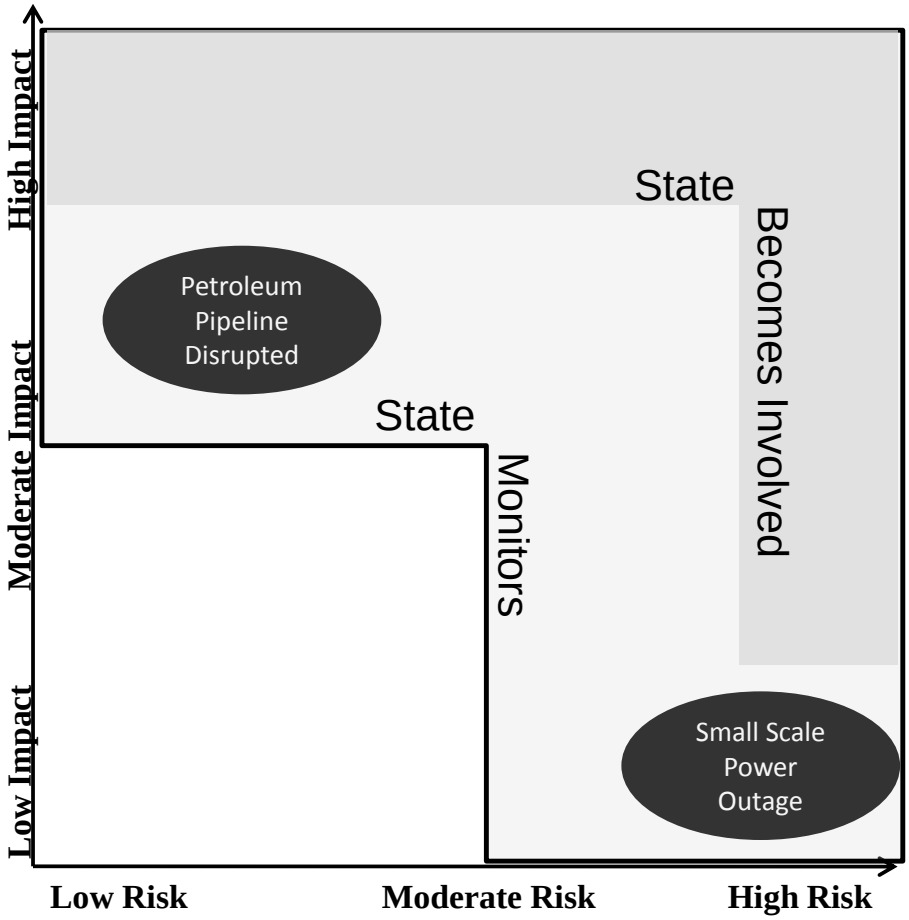


Figure 7. Simple Description of Risk and Impact Assessment for Different Disruptions

IV. Implementation of a Supply Disruption Tracking Process

Management Decision Process

The final step in the disruption and restoration tracking process will be the development of a management decision process for each energy source and each potential disruption for that energy source. The EAE at the Department of Commerce is the person responsible for monitoring the supply and/or disruption within the state of Illinois government. He is aided by the energy assurance analyst. Also, in the management plan will be a list of the largest consumers that will need to be contacted in case of a disruption to their location.

Situational Awareness

Once a week, the EAE will be notified of any significant movements in energy supply, prices or other important happenings by the energy assurance analyst. The analyst will send a list of sources with either web page links or results from these web pages so they can quickly access the information necessary to monitor the energy supply for longer term disruptions from price and supply changes. For instance, the state energy assurance analyst will receive weekly and daily emails that access web pages containing gas prices, oil prices and other sources of information on supplies. If feasible in the state budget, this person will quickly compile a weekly report to be submitted to the StateEAE. The EAE will also be trained in situational awareness, energy supply disruption tracking, the use of iCAV and other infrastructure related software and communication of these events to ensure they are prepared to monitor for and respond to energy supply disruptions for their energy source. The state of Illinois has not made a decision on whether one individual and/or agency will be responsible for monitoring and responding to disruptions or if it will be people from multiple state agencies based on the source being monitored. This decision will be made before the completion of the Energy Reference Guide and any training exercises.

There will be four stages associated with supply disruption tracking. These stages are taken directly from the Michigan Supply Disruption Tracking Plan as the State of Illinois was allowed to review this document and found these stages to capture the modes of awareness for energy supply disruption tracking quite well. These stages include 1) monitoring for a disruption 2) elevated risk 3) event triggered, and 4) recovery and lessons learned.

Monitoring for a disruption: Using the information sources and automated emails described above, the person or persons responsible for monitoring the supply, demand and infrastructure for each energy source (petroleum, natural gas, electricity, ethanol) will review this data and using their training, monitor for changes which are indicative of reductions in supply, increases in demand or a failure in the infrastructure. Using the supply disruption tracking database risk assessment, the analyst should be able to understand when a change warrants state involvement and what that involvement should be. This person will be responsible for a weekly or monthly report to the SEO.

Elevated Risk: It should be understood, that there will be times when a developing circumstance warrants heightened analysis of supply, demand or infrastructure but not direct state involvement; a developing hurricane, a crisis in the Middle-east, a heightened DHS security level or an extended heat wave are examples of these situations. In these situations, the analyst will spend additional time monitoring for changes specific to the identified risk and send daily reports to the energy office. Additional analysts may also be involved.

Event Triggered: A disruption in energy supply can be sudden, as when a pipeline breaks, or occur after a period of elevated risk such as a hurricane hitting the US Gulf Coast and disrupting petroleum supply (see reporting a disruption below). When an event is triggered, the analyst will begin full time monitoring. Once the extent of the event is determined to be at the level justifying state involvement, the analyst will contact theSEO. The SEO will then make the decision as to who additional is contacted. For instance, the IEMA and the Governor's Office may be contacted along with private energy providers, federal government agencies as appropriate and local authorities that may be impacted by the disruption. See below section for further instructions on communications with media and policy makers.

Recovery and Lessons Learned: Once a significant event has occurred, the state will assist the private energy providers as necessary for the restoration of services. Communicate with the providers and federal agencies to determine if alternative energy sources or infrastructure needs to be diverted (for instance state reserves of oil or emergency reserves of ethanol after a crude oil pipeline disruption). After energy supply is restored, the state analyst and energy office will compile a report which defines the disruption, determines any steps that may have averted the supply and any restoration services which could have been performed better and provide this report to the Governor's Office and the private energy providers.

Reporting a Disruption

A clear pathway for reporting of disruptions from private entities, emergency management personnel, first responders and others who first discover the disruption to the necessary state agency personnel and private entity personnel who will then contact additional support will be identified (Figure 8). The management decision process will include a set of criteria by which disruptions are validated and a clear set of recommendations for actions based on the energy source, the disruption and the severity of the disruption. Again, if a disruption is not too severe, the private sector will be responsible for restoration.

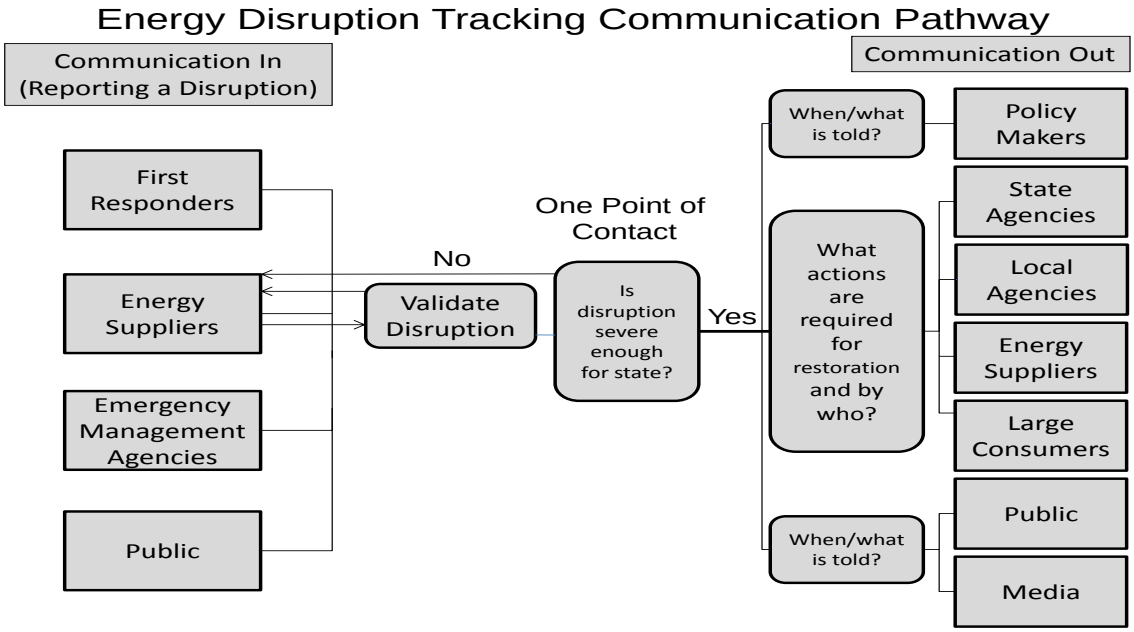


Figure 8. Within-state Communication Pathway for Energy Disruption Restoration

Communications during a Disruption

The final phase of the management decision process will regard communication to and from policy makers and the media. A person or persons from multiple agencies will be identified in the plan. This person(s) will be responsible for all communication with the media and/or policy makers regarding the release of information, request for assistance etc. in regards to the disruption. The management decision process will be posted on the internet clearly identifying the appropriate contacts for given scenarios and their contact information (Addendum 3). The appropriate private industry representatives will be provided with the list and encouraged to notify the appropriate analyst to report a disruption and indicate restoration plans.

V. Example Supply Disruption Tracking Scenarios

Scenario One: Crude Oil Pipeline Disruption

In this scenario, a crude oil pipeline delivering oil to a Chicago refinery is disrupted. This is a sudden disruption. There were no events leading up to the disruption that would have indicated its occurrence. The situation goes from standard monitoring to event triggered (Figure 9). The event is reported from the company that operates the pipeline to the appropriate state official. The company estimates the disruption is going to reduce the production of petroleum products by 20% for several weeks while the pipeline is repaired, not only to the state of Illinois but to surrounding states. The first question the analyst asks is the impact great enough for state involvement. If not, the analyst will monitor the situation in an elevated risk mode until the pipeline is restored or disruptions become more severe. If it is decided that the impact of the situation warrants state involvement, the SEO will be notified. The Energy Office will then decide whether the media and policy makers need to be notified. If appropriate, the Office will contact the appropriate representative of the Governor's Office, the IEMA and the private company involved in the disruption for an emergency conference call. During the call, decisions will be made upon a further review, as to whether the media should be contacted and whether the state should offer resources and/or energy supplies to mediate the situation such as releasing state oil reserves or asking the ethanol industry for emergency supplies of ethanol. If nothing else, actions such as these from the state may alter public perception of the severity of the event and make the public feel that the state is doing something to help.

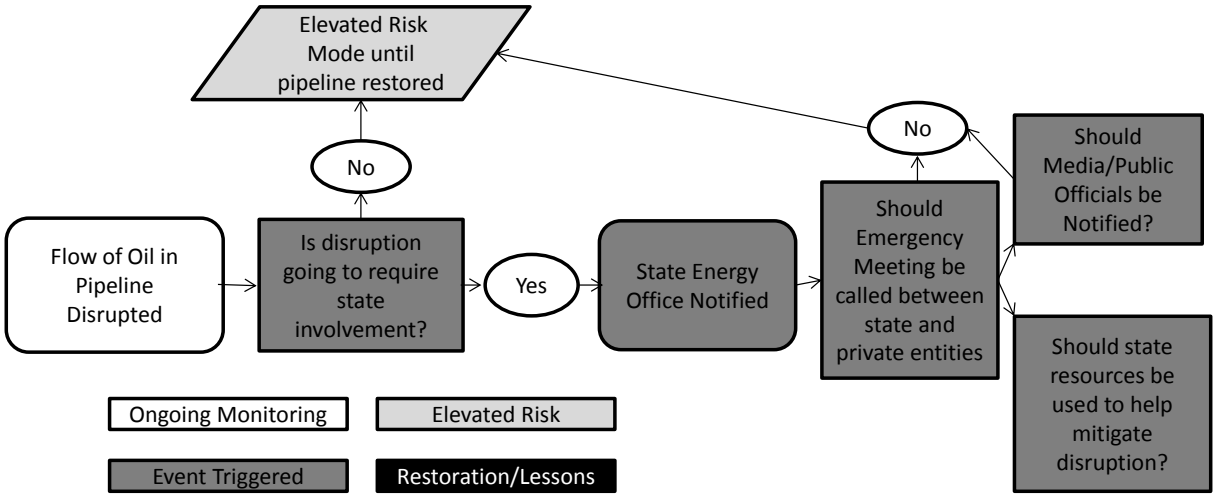


Figure 9. Flow chart for decisions associated with supply tracking from oil pipeline disruption

Scenario Two: Hurricane in Gulf of Mexico Disrupts

Under this scenario, prolonged monitoring will be required as a hurricane enters the Gulf of Mexico. Gulf oil wells will shut down production as a hurricane approaches disrupting supplies of crude oil to the state of Illinois and causing a real supply interruption or at a minimum increasing gasoline prices from a perceived disruption. State monitoring and effective communication can help alleviate citizen and policy maker concerns. The analyst will begin the process by monitoring for signs of a hurricane developing in the Gulf or moving in to the Gulf from the Atlantic. Many weather websites such as Weather Underground and the Weather Channel monitor tropical weather and the development and modeled trajectory of storms. Once a tropical depression has been identified and has moved in to the Gulf causing wells to stop production, the analyst will begin to monitor petroleum supplies for the number of days of supply and communicate with private sector providers of petroleum to the state. The analyst will also monitor commercial sites such as gasbuddy.com to determine if gas prices are going up around the state. If the storm intensifies and appears to threaten long term production, the analyst will notify the SEO. The SEO will then monitor the situation and make a decision on when to contact the media and the Governor's Office. A quick press release to the media notifying that the state is prepared to release oil reserves and monitor for unnecessary price increases by gas stations may allay concerns by citizens and keep gas prices down while the situation is monitored. If there is damage to oil wells in the Gulf significant enough to disrupt long-term supplies and impact days of supply, the SEO and Governor's Office will determine the appropriate steps at the appropriate times to help control the situation.

Acknowledgements: This Energy Supply Tracking Process Plan has benefited significantly from a review of a draft of the *2010 State of Michigan Energy Supply Disruption Tracking Process Plan* and the National Association of Energy Officials Energy Assurances Guidelines version 3.1.

Addendum 1: Information Sources

Ongoing Monitoring (Supply, Demand and Infrastructure)

All Sources

DHS iCAV infrastructure GIS connection site

http://www.dhs.gov/files/programs/gc_1217445858859.shtm

EIA Energy Assurance Daily

http://www.oe.netl.doe.gov/ead.aspx

EIA – Illinois Energy Profile

http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=IL

EIA – Short Term Energy Outlook

http://www.eia.doe.gov/emeu/steo/pub/contents.html?featureclicked=1&

EIA – Annual Energy Outlook

http://www.eia.doe.gov/oiaf/aeo/index.html

EIA – International Energy Outlook

http://www.eia.doe.gov/oiaf/ieo/index.html

Electric

Electric Power Monthly Use Report

http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html

DOE Quarterly Coal Report

http://www.eia.doe.gov/cneaf/coal/quarterly/qcr_sum.html

US EPA eGRID electrical grid information website

http://cfpub.epa.gov/egridweb/

EIA – Illinois' Electricity Profile

http://www.eia.doe.gov/cneaf/electricity/st_profiles/illinois.html

EIA – OE 417 Major Electric Disturbances & Unusual Occurrences YTD (Table B.1)

http://www.eia.doe.gov/cneaf/electricity/epm/tableb1.html

NERC Electric Sector Threat Advisory Level

http://www.nerc.com/page.php?cid=6|69|312

NERC Awareness Bulletins

http://www.nerc.com/page.php?cid=6|69|313

Petroleum

EIA Petroleum Publications Website

the http://tonto.eia.doe.gov/dnav/pet/pet_pub_publist.asp

American Petroleum Institute Statistics Page

http://www.api.org/statistics/

AAA Fuel Gauge Report

http://www.fuelgaugereport.com/

Natural Gas

EIA Natural Gas Monthly Report

http://www.eia.doe.gov/oil_gas/natural_gas/data_publications/natural_gas_monthly/ngm.html

Illinois Commerce Commission Annual Report on Natural Gas Use and Companies

http://www.icc.illinois.gov/reports/Results.aspx?t=1

Illinois Commerce Commission Annual Report on Natural Gas Prices

http://www.icc.illinois.gov/publicutility/salesstatistics.aspx?t=g

NYMEX Henry-Hub Natural Gas Price

http://www.oilnergy.com/1gnymex.htm

Henry Hub Gas Futures & City Gate Physical Gas Prices

http://www.enerfax.com

Renewable

EIA State Renewable Energy Profiles

http://www.eia.doe.gov/cneaf/solar.renewables/page/state_profiles/r_profiles_sum.html

Biorefinery locations

http://www.ethanolrfa.org/bio-refinery-locations/

Potential Electricity Generation from Wind Map

http://www.windpoweringamerica.gov/wind_resource_maps.asp?stateab=il

Current Wind Energy Project

http://www.awea.org/

Emerging Potential Event

All Sources

DOE – OE ISER Report Energy Assurance Daily (EAD)

http://www.oe.netl.doe.gov/ead.aspx

EIA – State Energy Data System: Illinois

http://www.eia.gov/state/state_energy_profiles.cfm?sid=IL

Energy Assurance Guidelines, Volume 3.1

http://www.naseo.org/eaguidelines/

Geographic Information System (GIS) – iCAV & DHS Earth

https://icav.dhs.gov/

https://icav.dhs.gov/dhsearth/

NOAA National Weather Service Heating & Cooling Degree Days

http://www.ncdc.noaa.gov/oa/documentlibrary/hcs/hcs.html

Hurricane Information – Bureau of Ocean Energy Management, Regulation, & Enforcement

http://www.gomr.mms.gov/homepg/whatsnew/hurricane/index.html

National Tropical Storm and Hurricane Warnings

www.wunderground.com/tropical

Electric

FERC Midwest Electric Power Markets

http://www.ferc.gov/market-oversight/mkt-electric/midwest.asp

NERC Alerts

http://www.nerc.com/page.php?cid=5|63

NERC Energy Emergency Alerts

http://www.nerc.com/page.php?cid=5|65

NERC Reliability Assessments

http://www.nerc.com/page.php?cid=4|61

NERC System Performance Indicators

http://www.nerc.com/page.php?cid=4|37

NERC Annual System Disruption Reports

http://www.nerc.com/page.php?cid=5|66

EIA – Electric Power Flash

http://www.eia.doe.gov/cneaf/electricity/epm/flash/flash.html

EIA – Electric Power Monthly

http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html

EIA – Electric Power Annual

http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html

EIA – Wholesale Market Data

http://www.eia.doe.gov/cneaf/electricity/wholesale/wholesale.html

EIA – Coal Fuel Data

http://www.eia.doe.gov/fuelcoal.html

Reports:

1. Coal News & Markets
2. Weekly Coal Production
3. Weekly Nymex
4. Monthly Energy Review, Coal
5. Quarterly Coal Report
6. Quarterly Coal Distribution
7. Annual Coal Report
8. Annual Coal Distribution
9. Annual Energy Review, Coal

Analysis:

1. U.S. Coal Supply & Demand
2. Coal Production in the US
3. Coal Transportation Information
4. Contract vs Spot Market Prices

EIA – Generation Capacity & Plant Availability (Power Plant Inventory in the United States

http://www.eia.doe.gov/cneaf/electricity/page/eia860.html

High-Impact, Very Low Probability Risks

http://www.nerc.com/page.php?cid=6|69|327

FERC Coal Shipment Origins by Supply Basin by State

http://www.ferc.gov/market-oversight/mkt-electric/midwest.asp#gen

Petroleum

American Petroleum Institute

http://www.api.org/statistics/supplydemand/index.cfm

Gasbuddy.com

www.GasBuddy.com

EIA - General Petroleum Publications Homepage

http://www.eia.gov/petroleum/

EIA - This Week in Petroleum

http://www.eia.doe.gov/oog/info/twip/twip.asp

EIA - Petroleum Navigator - Home page

http://www.eia.doe.gov/dnav/pet/pet_sum_top.asp

EIA - Weekly Petroleum Status Report

http://www.eia.doe.gov/oil_gas/petroleum/data_publications/weekly_petroleum_status_report/wpsr.html

EIA - US Weekly Gasoline Prices by Region

http://www.eia.doe.gov/oil_gas/petroleum/data_publications/wrgp/mogas_home_page.html

EIA - Weekly Retail On-Highway Diesel Prices

http://www.eia.doe.gov/oog/info/wohdp/diesel.asp

EIA - Gasoline & Diesel Fuel Update

http://www.eia.doe.gov/oog/info/gdu/gasdiesel.asp

EIA - Market Assessment of Planned Refinery Outages

http://www.eia.doe.gov/pub/oil_gas/petroleum/feature_articles/2010/outage2010a/outage2010a.html

EIA - Company Level Imports

http://www.eia.doe.gov/oil_gas/petroleum/data_publications/company_level_imports/cli.html

EIA - Petroleum Marketing Monthly

http://www.eia.doe.gov/oil_gas/petroleum/data_publications/petroleum_marketing_monthly/pmm.html

EIA - Petroleum Supply Monthly

http://www.eia.doe.gov/oil_gas/petroleum/data_publications/petroleum_supply_monthly/psm.html

EIA - Prime Supplier Report

http://www.eia.doe.gov/oil_gas/petroleum/data_publications/prime_supplier_report/psr.html

EIA - Heating Oil & Propane Update

http://www.eia.doe.gov/oog/info/hopu/hopu.asp

EIA - Refinery Capacity Report

http://www.eia.doe.gov/oil_gas/petroleum/data_publications/refinery_capacity_data/refcapacity.html

Event Triggered
Same as above, plus:

All Sources

DOE Emergency Situation Reports

http://www.oe.netl.doe.gov/emergency_sit_rpt.aspx

DHS Open Source Energy Sector Report

http://www.dhs.gov/files/programs/editorial_0542.shtm

Electric

Illinois Commerce Commission Annual Report on Electricity Reliability in the State

http://www.icc.illinois.gov/electricity/electricreliability.aspx

Ameren Electrical Outage Map

https://www2.ameren.com/outage/outagemap.aspx?state=IL

ComEd Electrical Outage Map

https://www.comed.com/_layouts/comedsp/OutageMap.aspx

MISO & PJM updates & Locational Marginal Pricing Information

http://www.ferc.gov/market-oversight/mkt-electric/midwest/miso-rto-dly-rpt.pdf

DOE – OE 417 Form (Electric Disturbance Event) (Table B.1)

http://www.eia.doe.gov/cneaf/electricity/epm/tableb1.html

EIA Federal Electrical Emergency

http://www.eia.doe.gov/cneaf/electricity/page/disturb_events.html

Petroleum

Minerals Management Service Updates (gulf disruption events)

http://www.gomr.mms.gov/homepg/whatsnew/hurricane/index.html

Natural Gas

Minerals Management Service Updates (gulf disruption events)

http://www.gomr.mms.gov/homepg/whatsnew/hurricane/index.html

All Sources

Coordinate with utility companies

Disruptions

Petroleum

http://www.eia.doe.gov/oil_gas/petroleum/data_publications/petroleum_supply_monthly/psm.html

Natural Gas

Natural gas disturbance modeling software from Argonne

http://www.dis.anl.gov/projects/ngfast.html

GAO Natural gas pipeline safety report to Congress

http://www.gao.gov/new.items/d06945.pdf

Electric

DOE Electric Disturbance Events Report

http://www.oe.netl.doe.gov/oe417.aspx

Federal Electric Event Emergency Alert and Incident Report

http://www.eia.doe.gov/cneaf/electricity/page/disturb_events.html

DOE emergency situations report for electricity

http://www.oe.netl.doe.gov/emergency_sit_rpt.aspx

Renewables

Yields and Crop Predictions for Corn and Soybeans

http://www.nass.usda.gov/

Appendix 2. Contacts for State Energy Assurance (Phone numbers removed for privacy but are available on internal document)

Last Name	First Name	Affiliation	Role
Aquino	Reynaldo	Chicago Dept. of Environment	local government
Aridas	Tom	Peoples Gas	Industry-natural gas
Beyer	Gene	Illinois Commerce Commission	state government- emergency management
Borgia	Kevin	Illinois Wind Energy Association	industry- renewables- wind
Boss	Terry	Interstate Natural Gas Association of America	industry- natural gas
Bronson	Ted	Power Equipment Associates	industry- renewables- CHP
Carnduff	Brad	Illinois State Police	State government- first responders
Chittim	Ron	American Petroleum Institute	industry- petroleum
Claude	Beth	Enbridge Energy Co.	industry- petroleum pipeline
Cobau	Ed	IMUA	industry- electric
Coleman	Terry	Shell Pipeline Company	industry- petroleum
Colarelli	Peter	Citgo	industry- petroleum
Conzelmann	Guenter	Argonne/Ifrastructure Center	federal government- infrastructure
Copenhaver	Ken	UIC ERC	UIC
Corr	Valerie	BP Whiting Refinery	industry- petroleum
Cummins	Bill	DHS Infrastructure Protection	federal government- infrastructure
Defenbaugh	Ray	Illinois Renewable Fuels Association	industry- renewables- biofuels
Deppolder	Dwain	City of Peoria Fire Dept	local government
Dougherty	Laurie	Illinois Section AWWA	industry- user
Doris	Mark	Marathon Petroleum	Industry=emergency response
Dragoo	Darryl	IEMA	state government- emergency management
Dwyer	Martin	IEMA	state government- emergency management
Eichholz	Dan	Illinois Petroleum Council	industry- petroleum
Fairow	Jana	IEMA	state government- emergency management
Fleschie	Bill	Illinois Petroleum Marketers Association	industry- petroleum

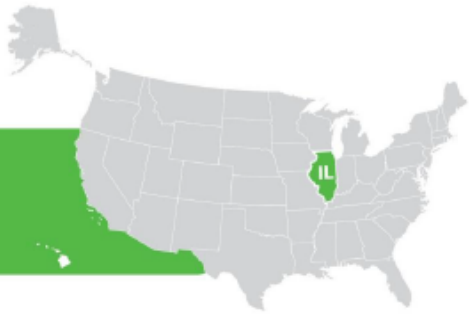
Fox	Daniel	NICOR	industry- natural gas
Frazier	Barry	Center Ethanol	industry- biofuels
Fridgen	Jon	Monsanto	industry- biofuels
Griffin	John	API	industry- petroleum
Griffis	Carl	PHMSA Central Region Office	federal government- infrastructure
Haas	Rick	Conoco Phillips Wood River Refinery	Industry-petroleum
Haley	Tim	Marathon Oil	industry- petroleum
Halting	Judd	Patriot Ethanol	industry- biofuels
Helhowski	Jim	Enbridge/Vector	industry- petroleum
Hoots	Diane	Illinois Central Man agement Services	State government- emergency management
Isbell	Chris	County Engineer, Stephenson County	state government- first responders
Johnson	Hilary	Witt Associates	industry- plan preparers
Kadansky	Richard	Marathon Petroleum	industry- petroleum
Kauerauf	Don	IEMA	State government- emergency management
Kenel	Mike	state of Michigan PUC	state government- other
Korty	Tom	IDOT	State government- emergency management
Lippert	Alice	US Department of Energy	federal government- supervising
Lloyd	Byron	Illinois Department of Commerce & Economic Opportunity	state government
Marek	Norm	Illinois Department of Commerce	state government- renewables
Martino	Maggie	Tri-county Regional Planning Commision	local government
Mathias	Richard	PJM	industry- electric
McAvoy	Mick	Illinois Law Enforcement Alarm System	state government- first responders
Moore	Kristy	Renewable Fuels Association	industry- renewables- biofuels
Mueller	Steffen	UIC ERC	UIC
Nania	John	Nania Energy	industry- natural gas
Narielwala	Rajiv	Illinois Department of Commerce & Economic Opportunity	State government-energy assurance engineer
Montes	Martin	ComEd	industry- electric
Pillon	Jeff	NASEO	federal government- supervising
Raburn	Janice	BP Products	industry- petroleum

Reardon	Jay	CEO MABAS-IL	state government- first responders
Richardson	Joe	Enbridge Pipeline	Industry- petroleum pipelines
Rybarczyk	Ron	BP Oil	industry- petroleum
Samsa	Michael	Argonne/Infrastructure Center	federal government- infrastructure
Schlicher	Martha	Monsanto Bioenergy	industry- renewables- biofuels
Scott	Don	National Biodiesel Board	industry- renewables- biofuels
Shaff	Nick	Midwest Energy Inc	industry- natural gas
Sheriff	Brice	Ameren Illinois	industry- electric
Simpson	Tricia	Exxon Mobil Joliet Refinery	industry- petroleum
Smith	Keith	Shell Pipeline Company	Industry- petroleum pipelines
Smith	Paul	IEMA	state government- emergency management
Snedic	Ron	Gas Technology Institute	industry- natural gas
Strutz	Jim	Springfield City Water Light and Power	industry- user
Sykuta	David	Illinois Petroleum Council	industry- petroleum
Talaber	Leah	Argonne/Infrastructure Center	federal government- infrastructure
Thompson	Trenton	IEMA	State government- emergency management
Walas	Fred	Marathon Petroleum	Industry- petroleum
Watson	Ryan	US Department of Energy	federal government- supervising
Winnie	Harold	PHMSA Central Region Office	federal government- infrastructure
Woodin	Dale	American Hospital Association	state government- users
Wolf	Tom	Illinois Chamber of Commerce	
Wulfkuhle	Gus	FEMA Region 5	federal government- emergency management

Appendix 3. State Energy Risk Profile

U.S. DEPARTMENT OF ENERGY

State of Illinois
ENERGY SECTOR RISK PROFILE



This State Energy Risk Profile examines the relative magnitude of the risks that the State of Illinois's energy infrastructure routinely encounters in comparison with the probable impacts. Natural and man-made hazards with the potential to cause disruption of the energy infrastructure are identified.

The Risk Profile highlights risk considerations relating to the electric, petroleum and natural gas infrastructures to become more aware of risks to these energy systems and assets.

ILLINOIS STATE FACTS

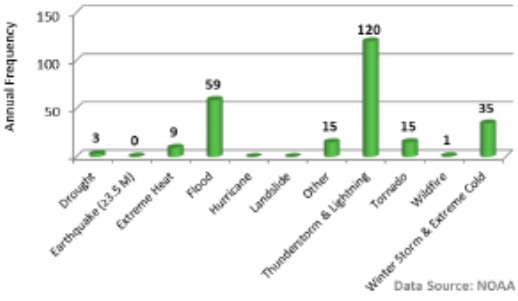
State Overview
- Population: 12.88 million (4% total U.S.)
- Housing Units: 5.29 million (4% total U.S.)
- Business Establishments: 0.31 million (4% total U.S.)

Annual Energy Consumption
- Electric Power: 143.5 TWh (4% total U.S.)
- Coal: 51,800 MSTN (6% total U.S.)
- Natural Gas: 642 Bcf (3% total U.S.)
- Motor Gasoline: 108,800 Mbarrels (4% total U.S.)
- Distillate Fuel: 45,000 Mbarrels (3% total U.S.)

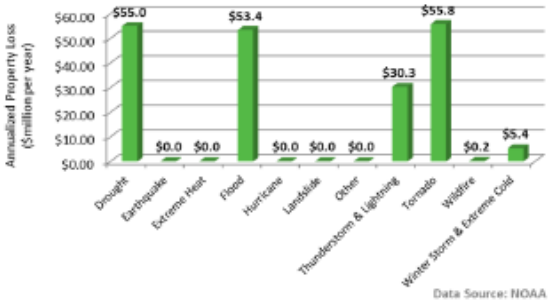
Annual Energy Production
- Electric Power Generation: 197.6 TWh (5% total U.S.)
  - Coal: 80.8 TWh, 41% [17.4 GW total capacity]
  - Petroleum: 0.1 TWh, <1% [0.8 GW total capacity]
  - Natural Gas: 11.2 TWh, 6% [16.7 GW total capacity]
  - Nuclear: 96.4 TWh, 49% [12.4 GW total capacity]
  - Hydro: 0.1 TWh, <1% [0 GW total capacity]
  - Other Renewable: 7.7 TWh, 4% [3.6 GW total capacity]
- Coal: 48,800 MSTN (5% total U.S.)
- Natural Gas: 0 Bcf (0% total U.S.)
- Crude Oil: 8,900 Mbarrels (<1% total U.S.)
- Ethanol: 30,300 Mbarrels (10% total U.S.)

NATURAL HAZARDS OVERVIEW

Annual Frequency of Occurrence of Natural Hazards in Illinois (1996–2014)



Annualized Property Loss due to Natural Hazards in Illinois (1996–2014)



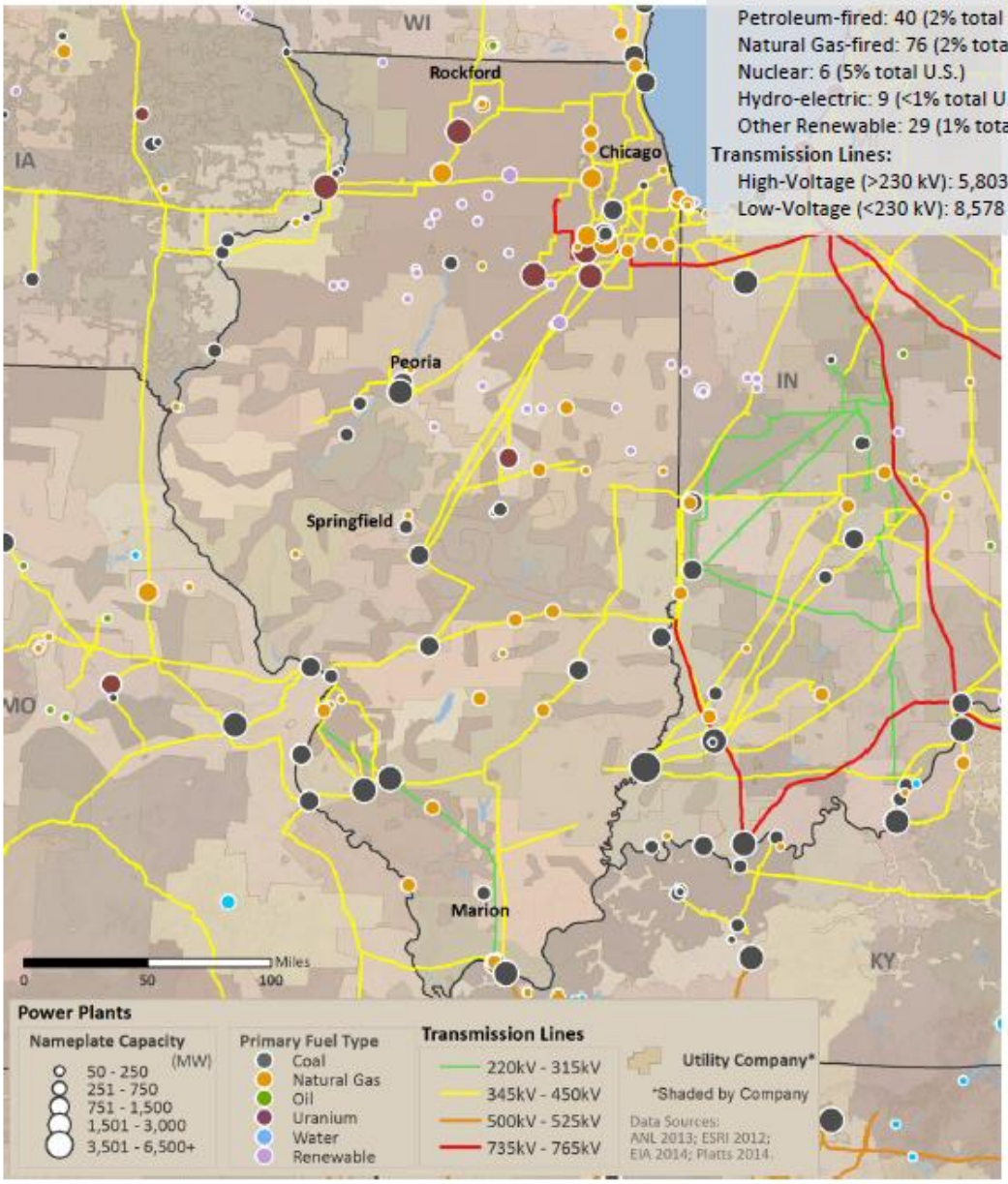
- According to NOAA, the most common natural hazard in Illinois is Thunderstorm & Lightning, which occurs once every 3 days on the average during the months of March to October.
- The second-most common natural hazard in Illinois is Flood, which occurs once every 6.2 days on the average.
- As reported by NOAA, the natural hazard in Illinois that caused the greatest overall property loss during 1996 to 2014 is Tornado at $55.8 million per year.
- The natural hazard with the second-highest property loss in Illinois is Drought at $55 million per year.

Produced by Department of Energy (DOE), Office of Electricity Delivery & Energy Reliability (OE)

ELECTRIC

Electric Power Plants: 187 (1% total U.S.)
- Coal-fired: 27 (2% total U.S.)
- Petroleum-fired: 40 (2% total U.S.)
- Natural Gas-fired: 76 (2% total U.S.)
- Nuclear: 6 (5% total U.S.)
- Hydro-electric: 9 (<1% total U.S.)
- Other Renewable: 29 (1% total U.S.)

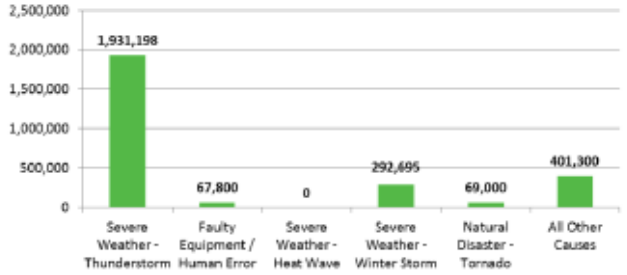
Transmission Lines:
- High-Voltage (>230 kV): 5,803 Miles
- Low-Voltage (<230 kV): 8,578 Miles



Electric Transmission

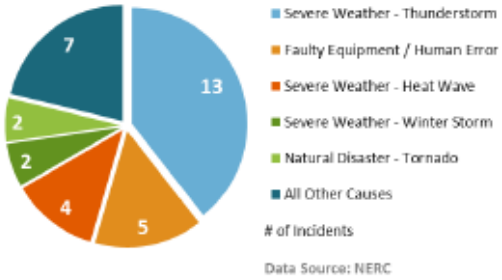
- According to NERC, the leading cause of electric transmission outages in Illinois is **Severe Weather - Thunderstorm**.
- Illinois experienced **33 electric transmission outages** from 1992 to 2009, affecting a total of **2,761,993** electric customers.
- **Severe Weather - Thunderstorm** affected the largest number of electric customers as a result of electric transmission outages.

Electric Customers Disrupted by NERC-Reported Electric Transmission Outages by Cause (1992–2009)



Data Source: NERC

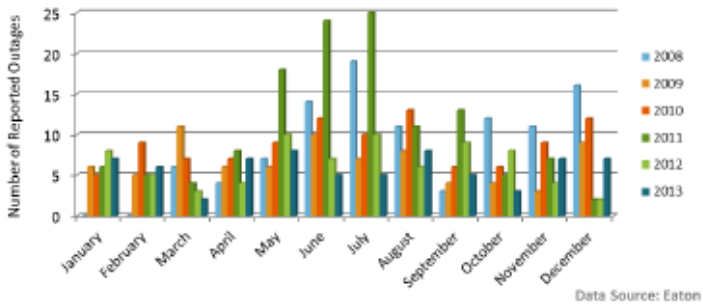
Number of NERC-Reported Electric Transmission Outages by Cause (1992–2009)



Data Source: NERC

Electric Distribution

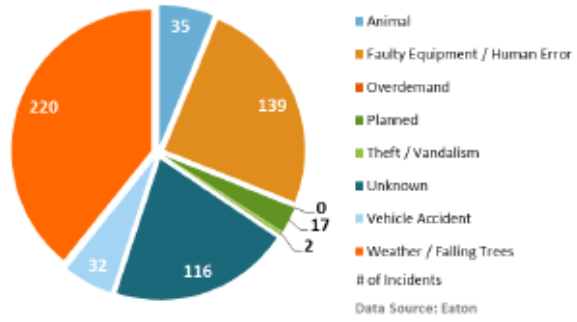
Electric-Utility Reported Power Outages by Month (2008–2013)



Data Source: Eaton

- Between 2008 and 2013, the greatest number of electric outages in Illinois has occurred during the month of **July**.
- The leading cause of electric outages in Illinois during 2008 to 2013 was **Weather/Falling Trees**.
- On average, the number of people affected annually by electric outages during 2008 to 2013 was **828,298**.
- The average duration of electric outages in Illinois during 2008 to 2013 was **5,742 minutes or 95.7 hours a year**.

Causes of Electric-Utility Reported Outages (2008–2013)



Data Source: Eaton

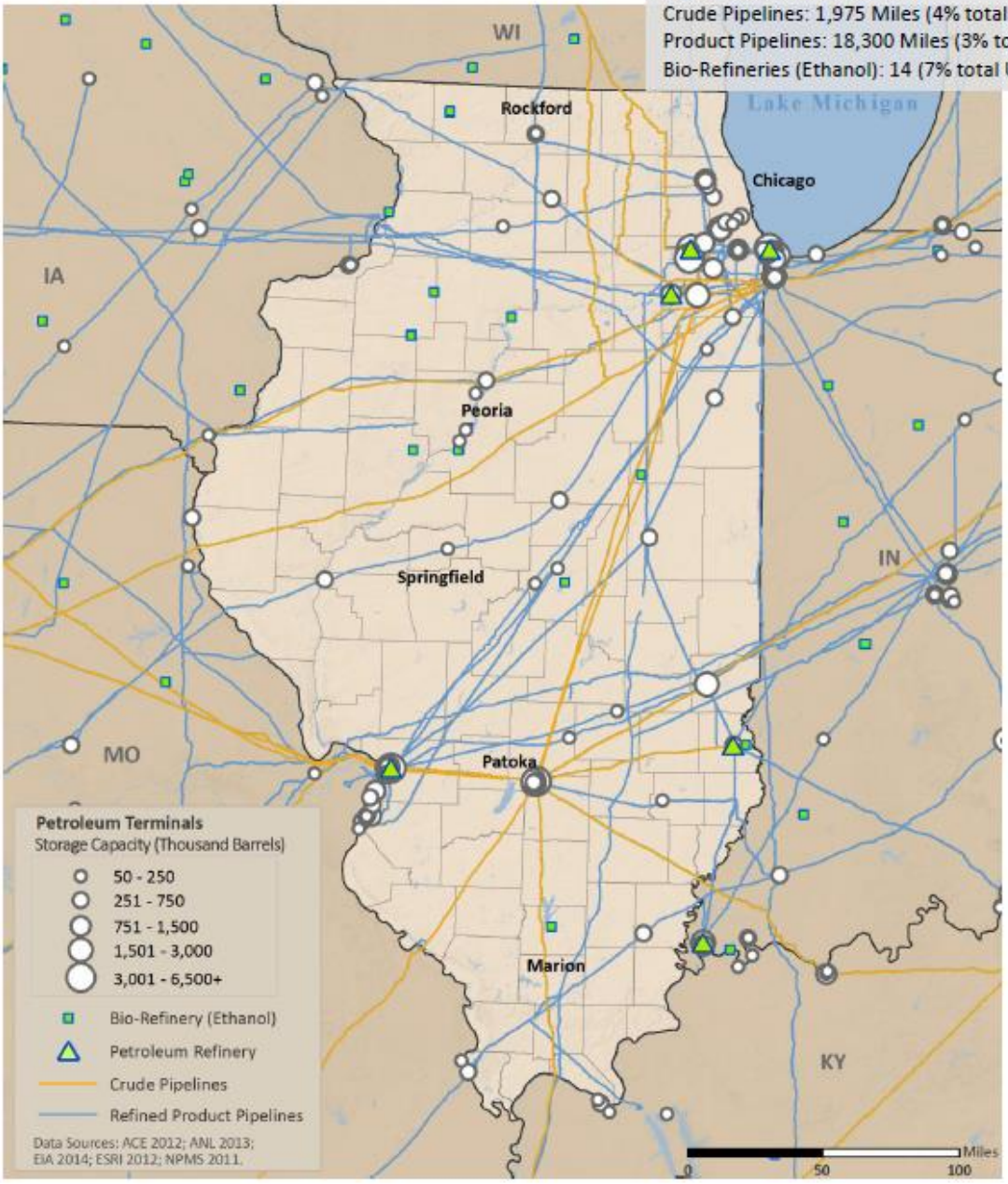
Utility Outage Data (2008–2013)

Data Source: Eaton

- NOTE: # of Incidents – The number within each pie slice is the number of event incidents attributable to each cause.

PETROLEUM

Petroleum Infrastructure Overview
Refineries: 4 (3% total U.S.)
Terminals: 66 (3% total U.S.)
Crude Pipelines: 1,975 Miles (4% total U.S.)
Product Pipelines: 18,300 Miles (3% total U.S.)
Bio-Refineries (Ethanol): 14 (7% total U.S.)



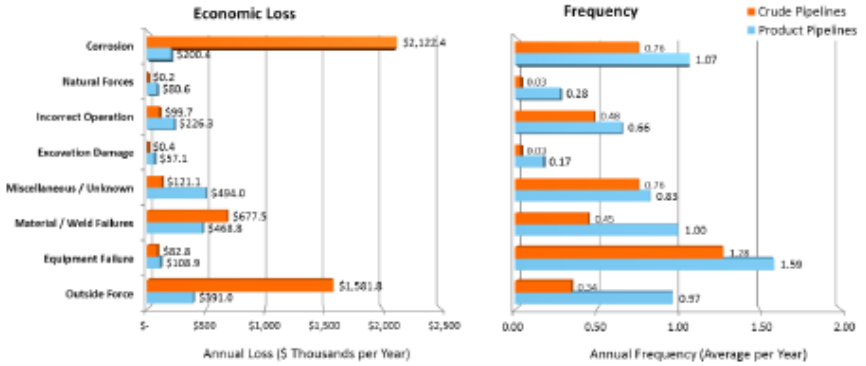
Petroleum Transport

Top Events Affecting Petroleum Transport by Truck and Rail (1986–2014)

Data Source: DOT PHMSA

- The leading event type affecting the transport of petroleum product by rail and truck in Illinois during 1986 to 2014 was Incorrect Operation for rail transport and Miscellaneous/Unknown for truck transport, with an average 3.9 and 13.3 incidents per year, respectively.

Top Events Affecting Crude Oil and Refined Product Pipelines in Illinois (1986–2014)



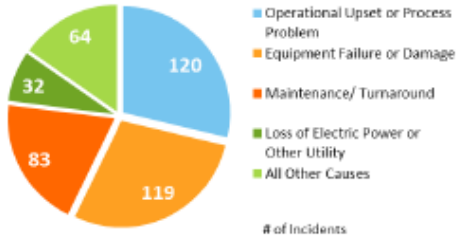
Data Source: DOT PHMSA

- The leading event type affecting crude oil pipeline and petroleum product pipelines in Illinois during 1986 to 2014 was Equipment Failure for crude oil pipelines and Equipment Failure for product pipelines, with an average 1.28 and 1.59 incidents per year, respectively.

Petroleum Refinery

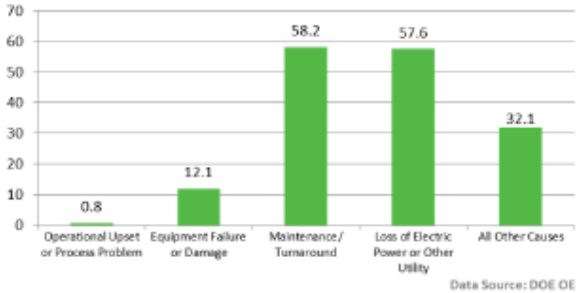
- The leading cause of petroleum refinery disruptions in Illinois from 2003 to 2014 was Operational Upset or Process Problem. Illinois's petroleum refineries experienced 418 major incidents from 2003 to 2014. The average production impact from disruptions of Illinois's refineries from 2003 to 2014 is 24.6 thousand barrels per day.

Top-Five Causes of Petroleum Refinery Disruptions in Illinois (2003–2014)



Data Source: DOE OE

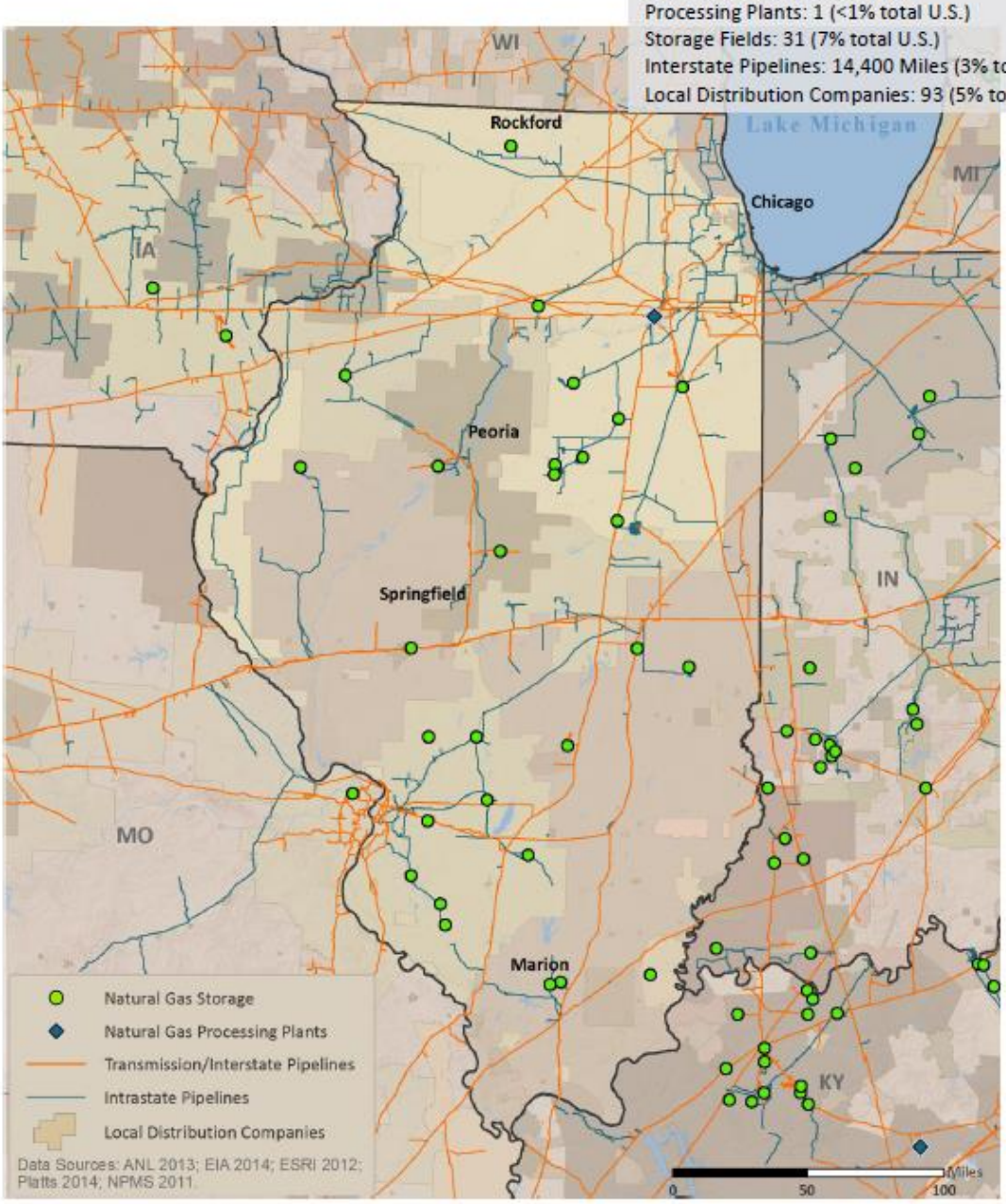
Average Production Impact (thousand barrels per day) from Petroleum Refinery Outages in Illinois (2003–2014)



Data Source: DOE OE

NATURAL GAS

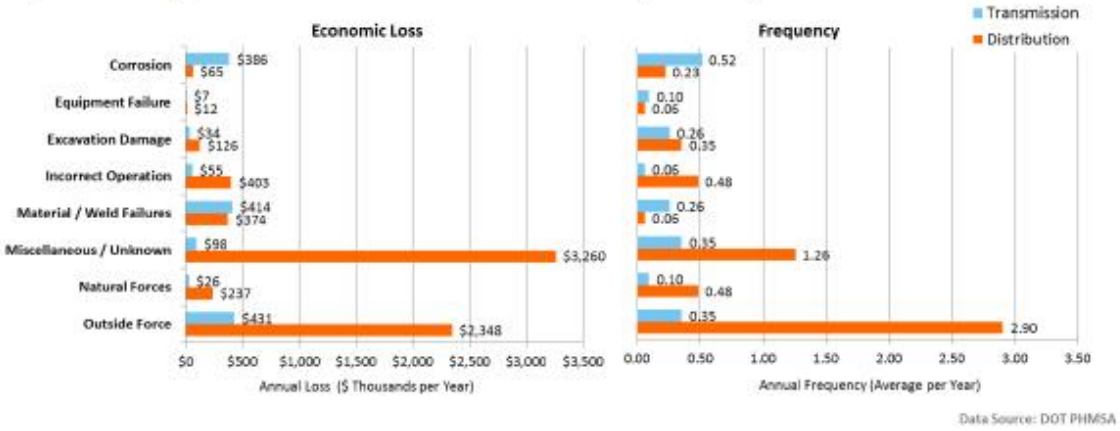
Natural Gas Infrastructure Overview
Gas Wells: 35 (<1% total U.S.)
Processing Plants: 1 (<1% total U.S.)
Storage Fields: 31 (7% total U.S.)
Interstate Pipelines: 14,400 Miles (3% total U.S.)
Local Distribution Companies: 93 (5% total U.S.)



Natural Gas Transport

› The leading event type affecting natural gas transmission and distribution pipelines in Illinois during 1986 to 2014 was Corrosion for Transmission Pipelines and Outside Force for Distribution Pipelines, with an average 0.52 (or one incident every 1.9 years) and 2.9 incidents per year, respectively.

Top Events Affecting Natural Gas Transmission and Distribution in Illinois (1986–2014)



Data Source: DOT PHMSA

Natural Gas Processing

› Insufficient public data are available on major incidents affecting natural gas processing plants in this state.